Magnum 6KQ
Managed Field Switch

Hardware

Installation and User Guide

Magnum™ 6KQ

Managed Field Switch

Hardware
Installation and User Guide

Part #: 84-00180Z (Rev. A)

Trademarks

Ethernet is a trademark of Xerox Corporation

NEBS is a trademark of Telcordia Technologies

UL is a registered trademark of Underwriters Laboratories

GarrettCom, Magnum and **Personal Switch** are trademarks and **Personal Hub** is a registered trademark of GarrettCom, Inc.

> **Important:** The Magnum 6KQ Managed Field Switch contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with Magnum 6KQ Switch products, consult Section 6, Troubleshooting, of this User Guide.

Printed in the United States of America.

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Federal Communications Commission
Radio Frequency Interference Statement

Radio Frequency Interference Statement

This equipment generates, uses and can radiate frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Canadian Emission

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil respecte toutes les exigences du Réglement sur le matériel du Canada. Cet appareil est Classe A..

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Revisions
04/07: Release as Rev A, first printing

THE MAGNUM LINE

Industrial networking products
"Designed and Manufactured in the USA"

Overview

GARRETTCOM, INC. OFFERS THE PREMIUM-QUALITY MAGNUM™ LINE OF INDUSTRIAL CONECTIVITY PRODUCTS WITH INDUSTRY-STANDARD FUNCTIONALITY AND BUILT-IN FIBER CONFIGURABILITY. MAGNUM PRODUCTS ARE DESIGNED FOR USE IN DEMANDING INDUSTRIAL GRADE, CARRIER CLASS, POWER UTILITY AND OEM APPLICATIONS WHERE RELIABILITY IS A PRIMARY CONSIDERATION.

6K-SERIES MANAGED FIELD SWITCHES, GIGABIT, 100 AND 10 MBPS, FIBER AND COPPER PORTS, MIX-AND MATCH. FEATURES SFF FIBER AND DC POWER IN 1U UNITS.

DX-SERIES SERIAL DEVICE ROUTERS, ETHERNET AND SERIAL

4K-SERIES SWITCHES, 100 AND 10 MBPS, COPPER PORTS WITH OPTIONAL FIBER PORT, WITH AUTO-NEGOTIATING FULL SWITCHING PERFORMANCE.

QUAD-SERIES FIBER SWITCHES, 100 & 10MBPS, FIBER AND COPPER PORTS, MIXED-SPEED AND MIXED-MEDIA TYPES, FULL SWITCHING PERFORMANCE.

MP62 AND P62F "OUTDOOR" ETHERNET SWITCHES, FOR TEMPERATURE UNCONTROLLED LOCATIONS, 6 10/100 AND 2 100MB FIBER PORTS, CAN BE CONNECTED IN STRINGS

MIXED-MEDIA FIBER HUB, 16-PORT, 10/100 AUTO-SENSING

DUAL SPEED 8-PORT AND 16-PORT, 10/100 AUTO-SENSING HUBS

PERSONAL SWITCHES, 10/100MB

8 PORT DUAL-SPEED, AUTO-NEGOTIABLE WITH FIBER OPTION

PERSONAL HUBS, **100MB OR 10/100MB** 8-PORT, WITH 2 SWITCHED PORTS (1 FIBER BUILT IN)

PERSONAL HUBS, 10MB SERIES 8-PORT + AUI, STACKABLE TO 5 HIGH, + OPTIONAL BNC OF FIBER PORT 8 OR 9-PORT AND 4 OR 5-PORT PERSONAL HUBS, W/ MAN. UP-LINK SW**.**

MEDIA CONVERTERS, 10MB AND 100MB SERIES, ALL MEDIA COMBINATIONS, INCL. FIBER ST, SC, MM., SINGLE MODE

THE "X-LINE" OF CONFIGURABLE MIXED MEDIA PRODUCTS:
STACKABLE CONCENTRATORS, SNMP OPTIONAL, 13-PORTS
MINI-CONCENTRATORS, 7 PORTS, **REPEATERS**, 2-PORTS
REPEATER PORT MODULES (RPMS), 6 TYPES FOR ETHERNET MEDIA
COAX TRANSCEIVERS, 10MB SERIES

APR, 07

1.0 SPECIFICATIONS
1.1 Technical Specifications

Performance

Filtering / Forwarding Rate:

Ethernet(10Mb):14,880 pps

Fast Ethernet(100Mb): 148,800 pps

Gigabit Ethernet (1000Mb): 1, 488,000 pps

Switching Processing Type: Store and Forward with IEEE 802.3x full-duplex flow -control, non-blocking

Data Rate: 10Mbps,100Mbps and 1000Mbps

Address Table Capacity: 4K node, self-learning with address aging

Packet buffer size : 240KB for 10/100 and 120KB for 1000Mb

Latency: 5 μs + packet time (100 to 100Mbps)

15 μs + packet time (10 to 10 Mbps, and 10 to 100Mbps)

Throughput with 12 10/100 and 2Glink max.- 4.76M pps (Transmit)

Back plane- 2.66Gb/s per slot

Network Standards and Compliance, hardware

Ethernet V1.0/V2.0 IEEE 802.3: 10BASE-T,

IEEE 802.3u: 100Base-TX, 100BASE-FX

IEEE 802.3z: 1000BASE-X Ethernet (Auto-negotiation)

IEEE 802.3ab: 1000BASE-X Ethernet

IEEE 802.1p: Priority protocol

IEEE 802.1d: Spanning tree protocol

IEEE 802.1w: Rapid Spanning tree protocol

IEEE 802.1q: VLAN Tagging

IEEE 802.3x: Flow Control

IEEE 802.3ad: Link Aggregation (Trunking)

IEEE 802.1x: Port based Network access control

IEEE802.3af: Power over Ethernet

Maximum 10 Mbps Ethernet Segment Lengths

Unshielded twisted pair	- 100 m (328 ft)
Shielded twisted pair	- 150 m (492 ft)
10BASE-FL multi-mode fiber optic	- 2 km (6,562 ft)
10BASE-FL single-mode fiber optic	- 10 km (32,810 ft)

Maximum Standard Fast Ethernet Segment Lengths:

10BASE-T (CAT 3, 4, 5 UTP)	- 100 m (328 ft)
100BASE-TX (CAT 5 UTP)	- 100 m (328 ft)
Shielded twisted pair	- 150 m (492 ft)
100BASE-FX, half-duplex, multi-mode	- 412 m (1350 ft)
100BASE-FX, full-duplex, multi-mode	- 2.0 km (6,562 ft)
100BASE-FX, half-duplex, single-mode	- 412 m (1350 ft)
100BASE-FX, full-duplex, single-mode	- 20.0 km (66KQ ft)
100BASE-FX, full-duplex, Long Reach	- 40.0 km (122K ft)

Maximum Standard Gigabit Ethernet Segment Lengths:

1000BASE-T (CAT5e or higher is recommended) - 100 m (328 ft)

1000BASE-SX, full-duplex, multi-mode(62.5μm cable) - 220m

1000BASE-SX, full-duplex, multi-mode(50μm cable) - 550m

1000BASE-LX, full-duplex, single-mode(62.5μm cable) -5Km

Fiber Multi-mode connector types supported:

Fiber Port, ST-type (twist-lock):Fiber multi-mode, 10Mb 10BASE-FL

Fiber Port, MTRJ-type (plug-in):SFF Fiber multi-mode100BASE-FX

Fiber Port, SC-type (snap-in):Fiber optic multi-mode, 100BASE-FX

Fiber Port, ST-type (twist-lock): Fiber optic m.-mode, 100BASE-FX

Fiber Port, 1000BASE-FX, SFP modules

Fiber Single-mode connector types:

Fiber Port, SC-type: Fiber optic single-mode, 100BASE-FX

Fiber Port, LC-type   Fiber SFF single-mode, 100BASE-FX

Fiber Port, 1000BASE-FX, SFP modules

LEDs: Per Port (one set at the port, one set on swivel top on right side)

LK: Steady ON when media link is operational

ACT: ON with receiver port activity

FDX/HDX: ON = Full-Duplex Mode

OFF = Half-Duplex Mode

100/10: ON = 100Mbps speed

OFF = 10 Mbps

Operating Environment

Ambient Temperature:

-40° to 140° F (-40° to 60°C) for UL60950 and Component Parts rating

-60° to 195° F (-50° to 85°C) for IEC 60068 Type Test short term rating

Storage Temperature: -60°to 210°F (-50°to 100°C)

Ambient Relative Humidity: 5% to 95% (non-condensing)

Altitude: -200 to 13,000 ft. (-60 to 4000m)

Conformal Coating (humidity protection) option: Request quote

Alarm Relay Contacts

One NC indicating internal power, one NC software controllable

Packaging

Enclosure: High strength extruded aluminum

Dimensions: 6.85 in. H x 7.5 in. W x 2.0 in. D

17.4 cm H x 19.1 cm W x 5.08 cm D

Cooling method: Convection, fully-enclosed ribbed-surface aluminum case used   as a sink, designed for vertical mounting, no fans

Weight: 3 lbs. (1.3 kg)

Management Console connector

Serial RJ-45, see details at sec. 3.7

DC Power Supply (Internal, floating ground design)

24VDC Power Input nominal (18 to 36VDC range)

-48VDC Power Input nominal (36 to 60 VDC range)

125VDC Power Input nominal (88 to 150VDC range)

Std. Terminal Block :   " -, GND, + "

Power Consumption:

35 watts typical (for a fully loaded fiber model)

12 watts typical (for a small 4 port copper-only model)

DC-DUAL POWER SOURCE (OPTIONAL)

For DC internal power supplies at –48VDC, 24VDC and 125VDC, with the Dual-Source option (for continuity of operation when either of the DC input sources are interrupted), see Appendices B and C.

Dual-Source Terminal Block :   " –A, -B, +A, +B "

6KQ Mounting:
Vertical mounting normal. Suitable for wall or DIN-Rail mounting (**6KQ**)

Agency Approvals and Standards Compliance:
  UL listed (UL60950), cUL, CE, Emissions meet FCC Part 15 Class A
  NEBS Level 3 and ETSI Compliant
  IEEE 1613 Class 2 Environmental Standard for Electric Power Substations
     See also **Note for Power Substations** in Section 3.2.4, 3.7, and 5.2.9
  IEC 61850 EMC and Operating Conditions Class C for Power Substations
  NEMA TS-2 and TEES for DC-powered and PoE-powered traffic control equipment
  Class1 Division 2 and ATEX for hazardous locations, pending

Warranty: Three years, per UL 60950 temperature rating

                                                      Made in USA

     See the Configuration Guide on the GCI web site at
http://www.garrettcom.com/techsupport/insertion_guides/6kqcg.pdf
for configurations and options..

     Email **info@GarrettCom.com** for additional information.

1.2 Ordering Information

Magnum Managed Field Switch (16 ports max)

MODEL   DESCRIPTION

Magnum 6KQ-   24VDC Magnum 6KQ Managed Field Switch, base unit with 24VDC power supply and four 10/100 copper ports. May be configured with a selection of 10/100/1000 fiber and copper port connector types from a family of 6KQ port modules per the 6KQ configuration guide, 16 total ports max. Heavy duty and environmentally hardened, no fans. Dual LEDs for all-around status viewing. Wire speed filtering and forwarding across all ports, 802.3x flow control, 802.1p priority packet processing, self-learning 4K-node address table, large 240KB packet buffers for 10/100 and 120KB for 1000Mb.

For licensed managed networks software (MNS-6K, RS-Ring and S-Ring) including GUIs for ease-of-use and industry-leading security features, see separate data sheets.

Magnum 6KQ -48VDC: Same as 6KQ-24VDC except the power input is -48VDC
Magnum 6KQP-48VDC: Same as 6KQ-48VDC except the four 10/100 RJ-45 are PoE
Magnum 6KQ-125VDC: Same as 6KQ-24VDC except the power input is 125VDC

PSAC-24V60 : External Hardened Power Supply for AC to 24VDC, 60 watts, panel or DIN-RAIL mount.

PSAC-48V150 : External Hardened Power Supply for AC to 48VDC for PoE, 150 watts, panel or DIN-RAIL mount.

Please use this URL: for the complete Configuration Guide for the Magnum 6KQ.
http://www.garrettcom.com/techsupport/insertion_guides/6kqcg.pdf

Configuration Options:

Each Magnum 6KQ base unit may be configured with a choice of 3 modular slots.
Following modules can be configured in Slot B and D (Slot C is 100Mb Fiber only)

Magnum 6KQ Port Modules

6KQ4-RJ45	TP Module, w/four 10/100Mbps copper ports,
P6KQ4-RJ45	PoE 6KQ module, four 10/100 copper ports with PoE on data pairs, may be configured in slot B only
6KQ4-RJMLC	"2+2" module, w/two RJ-45 ports and two 2km mm LC connectors
6KQ4-RJSLC	"2+2" module, w/two RJ-45 ports and two 15km Sgl-m LC connectors
6KQ4-RJMT	"2+2" module, w/two RJ-45 ports and two 2km mm MTRJ connectors
6KQ2-10ST	Two 10Mb mm Fiber 2km FL ST's
6KP4-MLC	SFF mm Fiber module, w/ four 100Mb mm FX LC connectors
6KP4-MT	SFF mm Fiber module, w/ four 100Mb mm FX MT-RJ connectors
6KQ2-MST	Two 100Mb Fiber module, w/ four 100Mb 2km FX ST connectors
6KQ3-RJMSC	"2+1" module, w/two RJ-45 ports and one 2km mm FX SC's
6KQ2-MSC	Two 100Mb Fiber module, w/ four 100Mb 2km FX SC connectors
6KQ2-SSC	Two 100Mb Fiber module, SM w/ 100Mb 20km FX SC connectors
6KQ2-SSCL	Two 100Mb Fiber module, SM w/ 100Mb 20km FX SC connectors

Fiber-only Slot C configuration choices

6KQF-4MT	"4 ports" module, w/four 100Mb mm 2km FX MTRJ's fiber ports
6KQF-4MLC	"4 ports" module, w/four 100Mb mm 2km FX LC's fiber ports
6KQF-4SLC	"4 ports" module, w/four 100Mb Sm, 15km FX LC's fiber ports
6KQF-2MST	"2 ports" module, w/two 100Mb mm, 2km FX ST's fiber ports
6KQF-2MSC	"2 ports" module, w/two 100Mb mm, 2km FX SC's fiber ports
6KQF-2SSC	"2 ports" module, w/two 100Mb Sm, 20km FX SC's fiber ports
6KQF-2SSCL	"2 ports" module, w/two 100Mb Sm, 40km FX SC's fiber ports
6KQF-2MLC	"2 ports" module, w/two 100Mb mm, 2km FX LC's fiber ports
6KQF-2SLC	"2 ports" module, w/two 100Mb Sm, 15km FX LC's fiber ports
6KQF-2MT	"2 ports" module, w/two 100Mb mm, 2km FX MTRJ's fiber ports
6KQF-1MST	"1 port" module, w/one 100Mb mm, 2km FX ST's fiber ports
6KQF-1MSC	"1 port" module, w/one 100Mb mm, 2km FX SC's fiber ports
6KQF-2SSC	"1 port" module, w/one 100Mb Sm, 20km FX SC's fiber ports
6KQF-1SSCL	"1 port" module, w/one 100Mb Sm, 40km FX SC's fiber ports
6KQ-BLNK	**Blank cover for 1 un-used 6KQ module slot**
Gigabit(1000Mb) module choices, slot D only	
6KQ-2GSFP	"SFP Gig" module, w/two SFP pluggable, open transceiver ports
6KQ-2GCU	"Copper Gig" module, w/two10/100/1000 RJ-45 ports
6KQ-2GSFPCU	"Copper Gig" module, w/ one SFP pluggable open transceiver port + one10/100/1000 RJ-45 ports
6KQ-1GSFP	"SFP Gig" module, w/one SFP pluggable, open transceiver ports
6KQ-1GCU	"Copper Gig" module, w/one10/100/1000 RJ-45 ports

Gigabit (1000Mb) SFP (Small Form Pluggable) Transceiver option (6KQ)	
SFP-SX	Giga SFP transceiver, 1000Mb-SX, 850nm wavelength, 500m
SFP-LX10	Giga SFP transceiver, 1000Mb-SX, 1310nm wavelength, 10Km
SFP-LX25	Giga SFP transceiver, 1000Mb-SX, 1310nm wavelength, 25Km
SFP-ZX40	Giga SFP transceiver, 1000Mb-SX, 1550nm wavelength, 40Km
SFP-ZX70	Giga SFP transceiver, 1000Mb-SX, 1550nm wavelength, 70Km
MNS-6K License- MNS-6K managed software is pre-loaded from the factory.	

S-RING Key: S-Ring and RS-Ring Redundancy Manager licensed software for redundant ring management. One S-Ring or RS-Ring key is for licensed use one 6K-managed self healing Ring.

CONSOLE- CBLQD   Serial-RJ45 cable, DB9 RS-232 " null-modem female connector on one side and RJ-45 on the other side for the RJ-45 Management port (Console port).

CONSOLE- CBLQU   USB -RJ45 cable, USB connector on one side and RJ-45 to the other side for the RJ-45 Management port (Console port).

DIN-RAIL-6KQ Din-Rail holder for a secure vertical mount, with screws for 6KQ

KQ-CABLE-BKT   Metal bracket for 6KQ, used for cable strain relief, for vertical mount

CONFORM05 CRM   conformal coating, heavy duty silicone at 5 mil thickness, for interior PCBs, PS and modules

GarrettCom, Inc. reserves the right to change specifications, performance

characteristics and/or model offerings without notice.

2.0   Introduction

2.1   Inspecting the Package and Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier of any damage that you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

1   Magnum 6KQ Managed Field Switch, base unit
      (configured with user-selected port module options installed)

1   Set of two metal vertical mounting brackets, with screws to the case

1   Installation and User Guide (this manual)

1   Product Registration Card

Remove the items from the shipping container. Be sure to keep the shipping container should you need to re-ship the unit at a later date. To validate the product warranty, please complete and return the enclosed Product Registration Card to GarrettCom, Inc. as soon as possible.

In the event there are items missing or damaged, contact the party from whom you purchased the product. If the unit needs to be returned, please use the original shipping container if possible. Refer to Section 6, Troubleshooting, for specific return procedures.

2.2   Product Description - Magnum 6KQ Field Switch

Magnum 6KQ Managed Field Switches provide maximum configurability in their class. The fiber-rich 6KQ can be configured with up to 12 100Mb fiber ports and two Gigabit ports. For 10/100 copper, regular or PoE-equipped 10/100 RJ-45 or 10/100/1000 copper ports may be configured to a maximum or 12 at 10/100 and 2 Gig ports. Magnum 6KQ comes with the best-of-breed MNS-6K managed networks software featuring GUI ease of use, Secure Web Management, SNMPv2,v3 management, 802.1p QoS Prioritization, Tag-based VLANs, IGMP Snooping and IGMP-L2 multicast management, port security, RADIUS and TACACS+ support, and a choice of redundancy options including RSTP and GarrettCom's rapid-ring-recovery S-Ring and RS-Ring products. See the Managed Networks Software (MNS-6K) datasheet for more information.

Magnum 6KQs are ideal for building a switched, hardened Ethernet network infrastructure, connecting edge devices such as PLCs and IEDs with upstream switches or routers. Designed for use in industrial applications such as factory floors and control cabinets, industrial video surveillance systems with PoE, power utility substations, tariffed carrier field facilities, or transportation and oil and gas, the rugged Magnum 6KQ handles stressful workloads (mixes of bursty data traffic and priority streaming traffic) as well as harsh environmental conditions.

Advanced thermal design techniques with ribbed –surface Aluminum

cases for maximum heat dissipation and a sealed case design enables the unit to operate in harsh Industrial grade environments efficiently. Heavy duty Ethernet Switch jobs are readily accommodated with an extended temperature rating of -40˚C to 60˚C by the UL Component Parts method, or -50˚C to 85˚C by the IEC 60068 Type-Test method. With options such as several popular DC power input types (optional AC power) and DIN-Rail mounting, the hardened Magnum 6KQ is a "multi-purpose" Industrial Ethernet Switch.

The 6KQ managed switches also provide PoE options via power – inside PoE modules on one of A, B or C slots and allows the users to select a wide option of combo PoE modules to support 802.3af pd devices. See details for PoE modules in sec 5.2.10. The Power Sourcing Equipment (PSE) is fully compatible with Powered Devices (PD)(e.g wireless access points, IP phones) that comply with the IEEE 802.3af PoE standard. The PoE switch ports have an auto-sensing algorithm, so that they provide power only to 802.3af, PoE end devices. PoE **is managed by a multi-stage handshake to protect equipment from damage and to manage power budgets** .The PoE ports will discontinue supplying power when the PoE powered devices are disconnected. This feature supports the 802.3af PoE PSE standard for over-current protection, under-current detection, and fault protection.

High performance features include non-blocking unicast traffic speed on all ports and 802.1p QoS Traffic Prioritization. Magnum 6KQ switches are "plug-and-play" and are designed for use in connecting edge devices such as PLCs, IEDs and PoE video cameras with upstream switches and routers where a mix of bursty data traffic and priority streaming traffic for video surveillance and cell-tower applications are
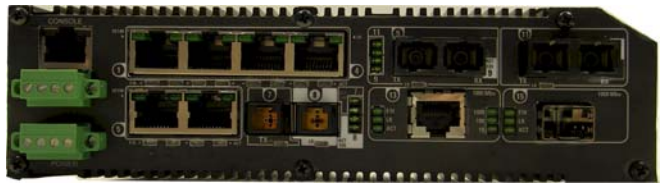
present.   Magnum 6KQ Field Switches are provided with LAN management software including SNMP, Tag- and Port-based VLANs, IGMP-L2 and IGMP Snooping, and Port Security with control via GUI and command line interface (CLI). For high availability LANs using ring topologies, Spanning Tree Protocol, RSTP, Link-Loss-Learn and S-Ring are available. Dual-Homing is a software configuration feature. See the Managed Networks Software (MNS-6K) and S-Ring datasheets for additional details on the comprehensive set of software programs and options.

Magnum 6KQ Managed Field Switches have heavy-duty aluminum cases and are readily available with standard Industrial grade 24VDC power. Alternative internal DC power options are available. DC power input types may be 24V, 48V, 125V, and dual source DC input is optional on all 6KQ's. (AC power is available via an external power supply unit, see Section 3.4 for details).

Alarm Relay contacts provided on each Magnum 6KQ Switch monitor the hardware and software through traps, providing a record of any losses of power signals and other user-defined software events. See Section 3.5 for details.

The wide selections of Quad port (queen size) modules are key to the flexibility and adaptability of Magnum 6KQs. Some of the popular 4 ports modules are described below. For a list of all the modules and options, see Section 1.2

NOTE: The 6KQ modules can only be configured at the factory.

2.2.1   Four-port SFF fiber modules (6KQ4-MTRJ, 6KQ4-MLC), 100Mb fiber

Fig.2.2.1 :
SFF Fiber Port Modules,
6KQ4-MTRJ (above) and
6KQ4MLC or -SLC (below)
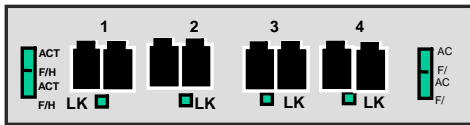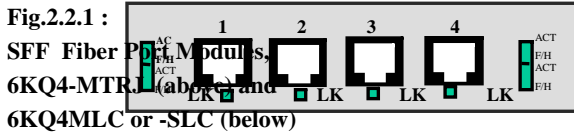
In a four-port SFF (Small Form Factor) fiber port module, all of the fiber ports are of the same speed (100Mb), mode, and connector type. Small Form Factor (SFF) Fiber Ports come in multi-mode forms MT-RJ or LC-type connectors, and single-mode form LC-type connectors.

The 100Mb fiber four-port modules for the Magnum 6KQ's normally are set (factory default) to operate in full-duplex mode for best fiber distance and performance. Using the 6K-MNS software, the user may select full- or half-duplex mode per-port through set port command. The set-up of the software (See Magnum 6K-MNS Software Manual) gives the user flexibility to adapt to any FDX or HDX type of Fast Ethernet devices).

There are three LED's per fiber port. The Link (LK) LED indicates "ready for operation" on that port when lit. The F/H LED indicates operation in full-duplex mode when ON (half-duplex when OFF). The blinking ACT LED indicates receiving Activity

on the port. A fiber cable must be connected into a SFF port and the Link (LK) indicator
for that port must be ON (indicating there is a powered-up device at the other end of the
cable) in order for a LK LED to provide valid indications of operating conditions on that
port.

2.2.2   Four-Port Copper Module, 6KQ4-RJ45

The 6KQ's 4-port Copper module, model 6K4-RJ45, provides four 10/100Mb switched

RJ-45 ports. The 10/100Mb
switched ports normally (as a
default setting) are independently
N-way auto-negotiating and auto-

crossover (MDIX) for operation at 10 or 100Mb speed in full- or half-duplex mode. (i.e.,
each independently selects a mode and speed to match the device at the other end of the
twisted pair cable).
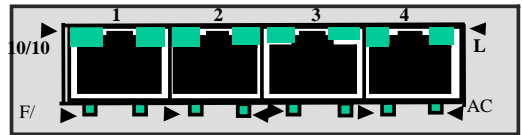
 (See Section 4.3 for auto-negotiation and MDIX details).

        On the model 6KQ-RJ45 module, there are four LEDs for each port, two
integrated into the connector, and two below the connector. The LK (Link) LED
indicates "ready for operation" on that port when lit. The blinking ACT (Activity) LED
indicates receiving Activity on that port when lit. The 10/100 LED indicates operation at
100Mb speed when ON and at 10 Mb speed when OFF (when auto-negotiation is not
disabled). The FDX/HDX LED is ON to indicate full-duplex operation and OFF to
indicate the half-duplex mode. A twisted pair cable must be connected into an RJ-45 port
and the Link (LK) indicator for that port must be ON (indicating there is a powered-up
device at the other end of the cable) in order for a LK LED to provide valid indications
of operating conditions on that port.

        Using the 6KQ (MNS-6K) management software, the user may disable auto-
negotiation and fix the desired operation of each RJ-45 port. The user may select 10Mb
or 100Mb speed and full- or half-duplex mode per-port as per user requirements. (See
Magnum MNS-6K Software Manual for details info.).

2.2.3 PoE (power pass-through), model P6KQ4-RJ45 (MDIX), 10/100Mb 4-port

        The PoE (Power-over-Ethernet) RJ-45 ports are similar to regular RJ-45 ports,
except they have the capability of providing power on each port to power up the PD
devices, per the IEEE802.3af PoE standard. The power-pass-through PoE modules are

dependent upon the -48VDC input power to supply the PD power for these RJ-45 (10/100) ports. Each port supplies up to 15watts to power the PoE PD devices. A maximum of 8 PoE ports can be configured in the A and B slots of a 6KQ switch with -48vdc power input. The PoE modules are also available with mix–n-match fiber modules configured in other 6KQ slots. Please check the Configuration Guide and the ordering information Sec.1.2 for all the various P6K PoE module options.

The   LEDs
on

P6KQ4-RJ45
4 Port@ 10/100Mb PoE Copper ports

① LK/ACT   ② 10/100

③ PoE   ④ FULL/HALF
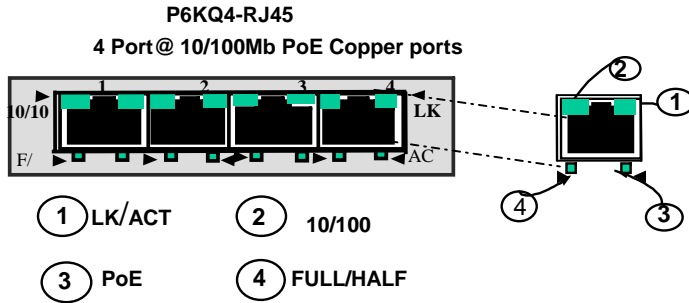
P6KQ4-RJ45- PoE modules are slightly different compared to regular (non-PoE) RJ-45 modules as shown in Fig 2. When the PoE port is in use, the PoE LED is ON when connected properly to an 803.af compliant PD device on that port. When non-PoE devices are connected, the PoE LED is OFF. The operation of Ethernet data traffic is not affected by PoE.

LINK and ACTIVITY LEDS are combined on the PoE modules into one LED that is marked as LINK/ACT, as shown in the diagram.

2.2.4 Two-Port Fiber Modules, 2@ 100Mb fiber
The two-port modules are available as two 100Mb fiber ports.   ST or SC connector styles are available utilizing multi-mode or single-mode fiber optics. These fiber modules may be factory configured with a choice of them in slot B and D only.

 The fiber port's LEDs indicate status the same as the SFF fiber modules in Section 2.2.2 above. Color-coding on the panel of the module shows which LEDs belong to which port.
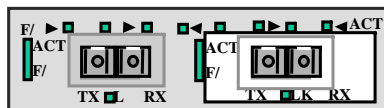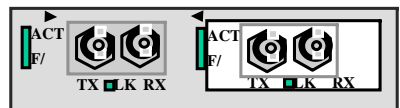
2@ 100 Mb SC   2@ 100 Mb ST

2.2.5   Two -Port 10 Mb mm Fiber ST Modules

The 2-port @10Mb ST fiber modules behave the same as the 2@100Mb ST fiber modules except for the 10Mb speed.

The default setup on the 10Mb fiber module is half-duplex, which allows the Magnum 6KQ Switch to connect to any 10Mb hub or media converter or almost any other device with a 10Mb fiber Ethernet port. The default setting of the 100Mb fiber module is full duplex. User mode-control per port through the MNS "port settings" **software is the same as the other 6KQ modules.**

The fiber ports support fiber cabling distances according to the 10BASE-FL and 100BASE-FX standards, i.e., 2km distance for multi-mode fiber. (Single-mode for greater distances may be available as a special order, request quote).

2.2.6   SFP Gigabit (1000Mbps) port modules

The Gigabit port options for the modular slot come in a few different configurations of Fiber SFP's or RJ-45's. The Magnum 6KQ offers only SFPs (Small Form Pluggable) for Gigabit speed.   There are multiple choices of SFP Gigabit transceiver types to combine with RJ-45's for the modular slot. Up to two Gigabit ports (max.) can be configured in the modular slot D only. An example of a two Gb module is the 6KQ-2GSFP (SFP fiber). An example of a single Gigabit module is the 6KQ-1GCU (10/100/1000Mb RJ-45 ports). A combo option of Gigabit copper and SFP fiber (6KQ-2GSFPCU) is shown below in the figure.

1@ 10/100/1000Mb RJ-45 + 1@ 1000Mb SFP

The 6KQ Modules provide an SFP opening for insertion of industry-standard SFP transceivers to provide Gigabit (Gb) media flexibility. Gigabit SFP modules are available in both multi-mode (550m) and single-mode (10, 25, 40, 70) km fiber options as well as a Gigabit copper option.

There are three LEDs mounted on each Gigabit port module. The Gigabit fiber has LEDs that indicate F/H (Full/Half duplex), LK (Link status) and ACT (receiving activity) on that port when lit. The copper Gigabit ports come with speeds indicating (10/100/1000Mb) LEDs also.

The operation of the Gigabit SFP and 10/100/1000 RJ-45 ports is as described for those port types above. For detailed information about 10Mb mm ST fiber half of the module, see Section 2.2.5.

2.2.7   Packet Prioritization, 802.1p QOS

Quality of Service means providing consistent predictable data delivery to users from datagram paths that go all across a network. As a LAN device, the Magnum 6KQ can do its part to prevent any QOS degradation while it is handling Ethernet traffic through its ports and buffers.

The Magnum 6KQ switching hardware supports the IEEE 802.1p standard and fulfills its role in support of QOS, giving packet processing priority to priority tagged packets according to the 802.1p standard. In addition to hardware support for QOS, the MNS software (R2) supports two priority queues that can be shared across the eight levels of defined packet priorities for application-specific priority control by the user through software configuration settings.

2.2.8   Frame Buffering and Flow Control

Magnum 6KQ's are store-and-forward switches. Each frame (or packet) is loaded into the Switch's memory and inspected before forwarding can occur. This technique ensures that all forwarded frames are of a valid length and have the correct CRC, i.e., are good packets. This eliminates the propagation of bad packets, enabling all of the available bandwidth to be used for valid information.

While other switching technologies (such as "cut-through" or "express") impose minimal frame latency, they will also permit bad frames to propagate out to the Ethernet segments connected. The "cut-through" technique permits collision fragment frames (which are a result of late collisions) to be forwarded which add to the network traffic. Since there is no way to filter frames with a bad CRC (the entire frame must be present in order for CRC to be calculated), the result of indiscriminate cut-through forwarding is greater traffic congestion, especially at peak activity. Since collisions and bad packets are more likely when traffic is heavy, the result of store-and-forward operation is that more bandwidth is available for good packets when the traffic

load is greatest.

When the Magnum 6KQ Switch detects that its free buffer queue space is low, the Switch sends industry standard (full-duplex only) PAUSE packets out to the devices sending it packets to cause "flow control". This tells the sending devices to temporarily stop sending traffic, which allows the traffic to catch-up without dropping packets. Then, normal packet buffering and processing resumes. This flow-control sequence occurs in a small fraction of a second and is transparent to an observer.

Another feature implemented in the Magnum 6KQ Switches is a collision-based flow-control mechanism (when operating at half-duplex only). When the Switch detects that its free buffer queue space is low, the Switch prevents more frames from entering by forcing a collision signal on all receiving half-duplex ports in order to stop incoming traffic.

2.2.9   Managed Network Software (MNS-6K) for Magnum 6KQ-Series

Magnum 6KQ's come with Rel3.6 licensed MNS-6K software, which allows the user to configure the Magnum 6KQ as a Managed Switch and implements security features and other software enabled features.

(NOTE: Magnum 6KQ managed switch will work with Rel 3.6 firmware or higher version only, using any other MNS-6K version will not support the hardware)

For additional information about MNS-6K, see the Magnum MNS-6K **Software User guide** in pdf format, a separate document normally accessible via your web-browser, at ftp://ftp.garrettcom.com/

or FTP client program at ftp.GarrettCom.com using

user : m6kuser

password : m6kuser

All MNS-6K software information, including new releases and upgrades related to MNS-6K software, can be accessed and download from GarrettCom's FTP site.

Alternatively, for the latest documentation and information, or needed GarrettCom's MIBs for SNMP, visit **www.GarrettCom.com/techsupport/index.htm#software** and look for the Magnum MNS-6K info.

For interactive training software which shows basic and advanced info about the Magnum MNS-6K management software and for a useful tool for first time users, visit **Magnum MNS-6K Operator Training**.

You may also email: info@GarrettCom.com for further information.

2.3   Features and Benefits

■ **Managed switching for high performance Ethernet LANs**

Magnum 6KQ Switches provide unicast non-blocking (all ports can run at full speed at once) performance with standard Managed Network Software (MNS-6K) included. They are typically used in LAN traffic centers with up to 12 100Mb +2 Gigabit ports for backbone connections, where managed network services are desired.

■ **Switching services includes 802.1p QoS packet prioritization**

The Magnum 6KQ switching hardware supports QoS, giving packet processing priority to priority tagged packets according to the IEEE 802.1p standard. For port- and application-specific priorities of data, the QoS software may be configured.

■ **Features Fiber-Built-In**

Magnum 6KQ Managed Field Switches are designed to naturally include fiber ports, and support mixes of multi-mode, single-mode; 10Mb, 100Mb and 1000Mb speed; full-and half-duplex; classic Small Form Factor (SFF) and GBIC fiber connectors. RJ-45 10/100 ports can also be configured in the mix of port types.

■ **S-Ring/RS-Ring and Link Loss Learn for reliable high availability using ring topology**   S-Ring/RS-Ring combined with the Link-Loss-Learn feature provides reliable fast recovery of a fault in a ring topology.

■ **Relay Contacts for monitoring internal power and user-defined software events**

Two Alarm Relay contacts monitor basic operations. One is for hardware, and will signal loss of power internally. The other is software controllable and will signal user-defined software events such as a security violation or an S-Ring fault condition.

■ **Vertical mounting for efficient convection cooling, no fans, extended temp.**

Mounting brackets for vertical mounting are included. DIN-Rail mounting hardware is optional. Ethernet signal and power cables attach at the bottom. Two sets of status LEDs are included, one set viewable at the port connector and one set viewable from the front.

■ **Standard AC power input, -48VDC or 24VDC or 125VDC input is optional**

Standard AC power input comes with an IEC plug and is auto-ranging for worldwide use. For special applications, models with –48VDC or 24VDC or 125VDC are available. Dual Source DC input can also be selected and configured on the DC power input models.

■ **Heavy-duty design for Industrial Ethernet and extended temperature operation**

Fiber ports take more power than copper ports, but the Magnum 6KQ design provides for this with heavy-duty components. The ambient temperature dual-rating is 60`C per UL methods, and 95°C per type test methods.

■ **MNS-6K licensed Management Software included, S-Ring/RS-Ring optional**

MNS-6K includes SNMP Switch Management with secure access control, RMON, CLI, Port Security; Port Mirroring; secured Radius and TACACs+, Telnet, TFTP, FTP support, Spanning Tree Protocol, Link-Loss-Learn, S-Ring (with license key) multi-level QoS, Port- and tag-based VLANs, GVRP, IGMP Snooping, SNMPc GUI support; Event Log; SNTP client for time-of-day; BootP and DHCP client for IP configuring, and password security and Secured Web interface.

2.4   Applications

Magnum 6KQ Field Switches offer high performance, modularity and availability. They provide the flexibility of 100Mbps fiber and copper ports as well as single or dual Gigabit (1000Mb) ports, with industry-standard LAN management software. Magnum 6KQ Switches are easily used in a variety of applications including client/server computing, secure VLAN- performance upgrades to departmental networks, and stream traffic for VOIP and audio/video applications. They can also be used in a very diversified combination of mixed media in Industrial floor applications. The performance characteristics of the 6KQ Switches enable them to inter-connect a series of subnets (one subnet per 6KQ Switch port) in a LAN traffic center. The subnet connections may be via fiber or twisted pair cabling, 100Mbps or 10 Mbps speed, and full-or half-duplex.

The mixed-media modular capability is ideal for industrial applications where existing Ethernet LAN network cabling must be accommodated. The fiber-built-in media capability is ideal for integrating future-proof fiber cabling into the LAN structure.

Example 1 : Magnum 6KQ Switch for a Industrial Application

Equipped with lots of useful features including hardened enclosures, a wide spread of DC power supply options, and extended temperature ratings qualifies the Magnum 6KQ Managed switch for any Industrial factory-floor, traffic control, transportation system, or power utility application. The several MNS-6K software operated features qualifies this managed switch to operate and perform securely and reliably in all critical applications. The addition of *S-Ring* and the *Link-Loss-Learn* software features allow this Managed switch to provide a very secure highly available redundant network capability in any ring topology network.

The Managed 6KQ's modularity along with the MNS-6K management software features remarkably handle industrial environments (i.e. where the factory floors are networked with Ethernet based mixed-media LANs equipped with PLCs, computers for taking readings and data from Machines, Client/ Server databases, etc. and sending these important data to the central office data warehouses) very securely and reliably. The DIN-Rail Mounting options on the Magnum 6KQ allow the factory floor's industrial user to mount the 6KQ securely anywhere on their Network setup.

The option of setting the ports at 10 or 100Mb on copper and 10 or 100Mb on

fiber media provide widespread options to the users to mix and match their legacy and advance network needs. The modularity of the 6KQ Managed Field Switches make them an attractive choice for use in applications with LAN connections to an organization's multiple site offices and factory- floors. The different locations can be easily connected together with the Fiber ports supported by the Magnum 6KQ Switch. A main NT-server in a secure area protected from earthquake or fire hazards can be connected to the full duplex Gigabit Fiber port.

Extended temperature ratings and a variety of options for AC/DC power supplies qualify this managed 6KQ switch for use in non-temperature controlled networks and many other temperature sensitive critical Industrial applications where above normal room temperatures occur while the network is in operation. Full-duplex future proof fiber media can easily connect long distance subnets and provide a stable secure network to all applications. The SNMP management capability of the Magnum 6KQ Switch helps create a database of all the network subnets to easily manage the network.

Magnum 6K25

SNMP Monitor

Main SERVER

FIBER Connection

FIBER Connection

Magnum 6KQ

Storage server

FIBER Connection

FIBER Connection

Internet

Router

FIBER Connection to other BLDG

Factory Floor PLC

Magnum 6KQ

Magnum 6KQ

Magnum 6KQ

Factory Floor PLC
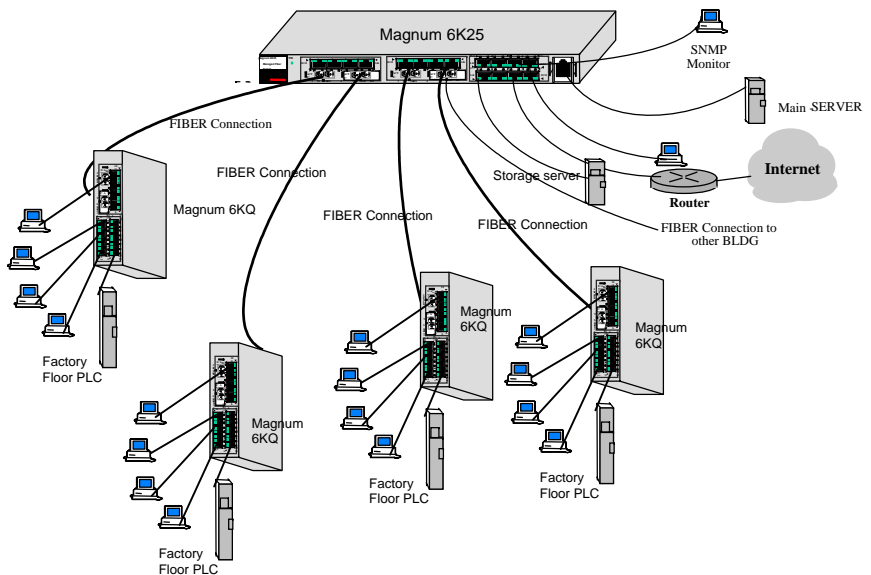
Factory Floor PLC

Factory Floor PLC

Fig. 2.4a- The industrial factory floor application with Magnum 6KQ

Example 2. A managed network is needed to provide a redundant ring topology for maximum redundancy. In a network where any faulty cable, cable disconnection or

power failure can bring the whole thing down, a ring switch can be reconfigured and up and running in milliseconds. The ring topology of the network consists of high speed LAN segments supported by 100Mbps full-duplex future-proof fiber media to provide a secure long distance LAN connection. The entire network is sharing a higher bandwidth Gigabit-enabled data-mining server for the vital database located in a separate secured building. The copper ports are required for multiple subnets inside the power plant to check the status of other Ethernet units. The entire spread network will be manageable to provide easy, detectable, uninterrupted support through a viewable SNMP monitor.

The Magnum 6KQ Managed Field Switch equipped with a mix of copper and fiber ports provides an economical and seamless solution to many requirements. The user-configurable Magnum 6KQ provides an extra boost to the network requirements by providing copper/fiber media along with the higher bandwidth support of 10/100 and 1000Mb. The user can utilize the SNMP feature equipped with VLAN, RMON, STP and other standard managed LAN features to provide a secure and stable network.

The 6KQ Managed Fiber with S-ring and Link-Loss-Learn features easily fulfill the redundant requirement with a secure and fast reconfiguration time for cable breakup when set up in a ring topology. The Gigabit port option boosts the bandwidth for high speed to support the peak traffic and minimize congestion.
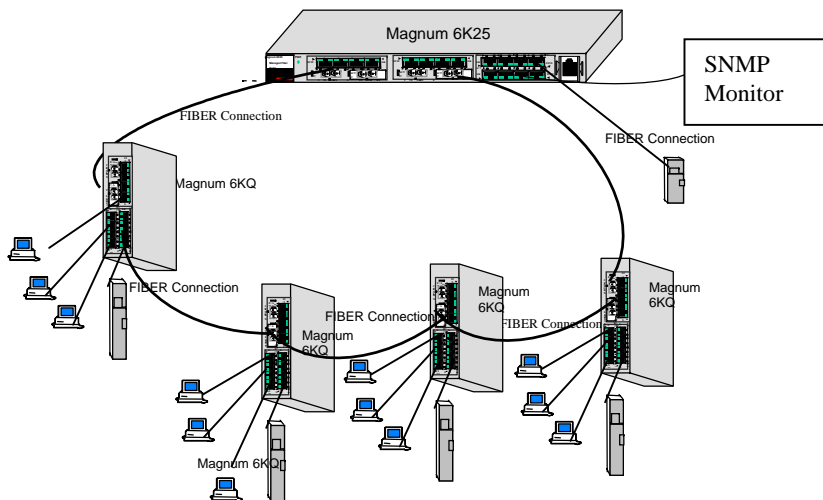

Fig. 2.4b-Magnum 6KQ equipped with S-Ring in redundant ring solution

Example 3.   In another application in an industrial environment, a 12 port Nebs compliant, -24VDC managed switch is required to meet the fiber and copper connections to cover the wider area of video CCTV. The switch must be SNMP enabled and managed to easily monitor the whole setup.

The Magnum managed field switch easily qualifies for this requirement with the various features and modularity it has. Loaded with MNS-6K management software, the field switch provides a very effective and economical solution for the video -vignette environment.

The security features (e.g. port-security, VLANs, SNMPv3, secure telnet, etc.) also boost the Magnum managed switches to provide a very effective and reliable solution. The modularity feature to support both copper and fiber at either 10/100/1000Mb speeds easily meets the various speeds of legacy and future broadband requirements.

In a fast growing secure video environment, the 6KQ is a reliable and secure solution. The modular design of the Magnum 6KQs, provide a wide range of copper/fiber options to meet requirements. The Gigabit uplink for storage or broadband uplink allows the telecom user a very effective solution to store their sensitive data securely.

Fig. 2.4c: Magnum 6KQs deployed in a video security CCTV application for monitoring and securing the premises

3.0   Installation

```
Before installing the equipment, it is necessary to take the
following precautions:
1.) If the equipment is mounted in an enclosed or multiple rack
assembly, the steady-state long-term environmental temperature
around the equipment must be less than or equal to 60⁰C.
2.) If the equipment is mounted in an enclosed or multiple rack
assembly, adequate airflow must be maintained for proper and
safe operation.
3.) If the equipment is mounted in an enclosed or multiple rack
system, placement of the equipment must not overload or load
unevenly the rack system.
4.) If the equipment is mounted in an enclosed or multiple rack
assembly, verify the equipment's power requirements to prevent
overloading of the building/s electrical circuits.
5.) If the equipment is mounted in an enclosed or multiple rack
assembly verify that the equipment has a reliable and
uncompromised earthing path.
```

This section describes installation of the

Magnum 6KQ Switches, as well as connection of the

various Ethernet media types.

3.1   Locating Magnum 6KQ Switches

For vertical panel mounting and wall mounting, see

Section 3.3.1.

For vertical DIN-Rail mounting, see Section 3.3.

For DC power input data, see Appendix B. For Dual Source, see Appendix C

.

      The rugged metal case of the Magnum 6KQ will normally protect it from accidental damage in a lab or workplace setting. Maintain an open view of the front to visually monitor the status LEDs. Keep an open area around the unit so that cooling can occur from convection while the unit is in operation. The 6KQ has no fans, so it is silent when in operation. Internal electronics use the case as a heat sink, so the unit may normally be quite warm to the touch.

3.2   Connecting Ethernet Media

      The Magnum 6KQ Switches are specifically designed to support all standard Ethernet media types within a single Switch unit. This is accomplished by using a family of different Port Modules which can be individually selected and configured per-slot. See Section 2.2 for a description of the PMs.

      The various media types supported along with the corresponding IEEE 802.3, 802.3D, 802.3u, 802.3AB and 802.3z standards and connector types are as follows:

IEEE Standard	Media Type	Max. Distance	Port Module
Fiber:			
100BASE-FX	mm^1 Fiber	220m (ft)	GBIC-SXSC
	sgl.m^2 Fiber	5Km	GBIC-LXSC
100BASE-FX	mm^1 Fiber	2.0km (6,562 ft)	6K4-MSC, -MST
	sgl.m^2 Fiber	18.0km (95K ft)	SSC, SSCL
small form factor	mm^1 Fiber	2.0km (6,562 ft)	6KQ-MTRJ, -MLC
small form factor	sgl.m^1 Fiber	15 km	6KP4V- SLC
Copper:			
10BASE-T and 100BASE-TX twisted pair		100m (328 ft)	6KQ-RJ45
1000BASE-TX twisted pair		100m (328 ft)	GBIC-TP
	^{1} mm = multi-mode		^{2} sgl.m = single-mode

3.2.1   Connecting Fiber Optic ST-type, "twist-lock"

The following procedure applies to installations using a PM with ST-type fiber connectors. This procedure applies to ports using a 6KQ module, MST-type port.

1.   Before connecting the fiber optic cable, remove the protective dust caps from the tips of the connectors on the PM. Save these dust caps for future use.

2.   Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

Note: One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.

3.   Connect the Transmit (TX) port (light colored post) on the Magnum PM to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection.

4.   Connect the Receive (RX) port (dark colored post on the PM) to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.

The LINK LED on the front of the PM will illuminate when a proper connection has been established at both ends (and when power is ON in the unit). If LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the PM connector to remedy this situation.

3.2.2   Connecting Fiber Optic <u>SC-type</u>, "Snap-In"
The following procedure applies to installations using a PM with SC-type fiber connectors, i.e., using 6Kq-MSC, 6KQ-SSC single-mode.
When connecting fiber media to SC connectors, simply snap on the two square male connectors into the SC female jacks of the 6KPM, until it clicks and secures.

3.2.3   Connecting <u>Single-Mode</u> Fiber Optic
When using single-mode fiber cable, be sure to use single-mode fiber port connectors. Single-mode fiber cable has a smaller diameter than multi-mode fiber cable (9/125 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode where xx/xx are the diameters of the core and the core plus the cladding respectively). Single-mode fiber allows full bandwidth at longer distances, and may be used to connect 10 Mb nodes up to 10 Km apart, or 18Km with the 6K-SSC.

The same procedures as for multi-mode fiber, applies to single-mode fiber connectors. Follow the steps listed in Section 3.2.2 above.

3.2.4   Connecting Twisted Pair (CAT3, CAT5, Unshielded or Shielded)
The RJ-45 ports of the Magnum 6KQ can be connected to the following two media types: 100BASE-TX and 10BASE-T. CAT 5 cables should be used when making 100BASE-TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used. In either case, the maximum distance for unshielded twisted pair cabling is 100 meters (328 ft).

Media	IEEE Standard	Connector
Twisted Pair (CAT 3, 4, 5)	10BASE-T	RJ-45
Twisted Pair (CAT 5)	100BASE-TX	RJ-45

NOTE :   *It is recommended that high quality CAT. 5 cable be used whenever possible in order to provide flexibility in a mixed-speed network, since 10/100 copper switched ports are auto-sensing for either 10 and 100Mb/s.*

The following procedure describes how to connect a 10BASE-T or 100BASE-TX twisted pair segment to the RJ-45 port. The procedure is the same for both unshielded and shielded twisted pair cables.

1. Using standard twisted pair media, insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the port. Note that, even though the connector is shielded, either unshielded or shielded cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established

NOTE: **for Power Substations:**   *In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the RJ-45 ports are intended for connectivity to other communication equipment such as routers or telecommunication multiplexers installed in close proximity (i.e., less than 2 meters or 6.5ft) to the 6KQ. It is not recommended to use these ports in substation applications to interface to field devices across distances which could produce kigh (greater than 2500V) levels of ground potential rise (GPR) during line-to-ground fault conditions. The 6KQ passes the 1613specifications for zero packet loss with fiber ports & with RJ45 ports used as indicated here.*

3.2.5 Connecting Twisted Pair (CAT5e or better, Unshielded or Shielded)

The RJ-45 Gigabit ports of the Magnum 6KQ can be connected to the media types, 1000BASE-T or CAT 5E or better 100-ohm UTP or shielded twisted pair (STP) balanced cable. The CAT 5E or better 100-ohm UTP or shielded twisted pair (STP) balanced cable is recommended to use when making 1000BASE-TX connections.   In either case, the max distance for unshielded twisted pair cabling is 100 meters (328 ft).

Media	IEEE Standard	Connector
Twisted Pair (CAT 5e)	1000BASE-T	RJ-45

The following procedure describes how to connect a 1000BASE-T twisted pair segment to the RJ-45 port. The procedure is the same for both unshielded and shielded twisted pair cables.

1. 1000BASE-T connections require that all four pairs or wires be connected. Insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the port. Note that, even though the connector is shielded, either unshielded or shielded cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established

3.2.6   Gigabit SFP (Small Form-factor Pluggable) Optical Transceivers

The small form-factor pluggable (SFP) is a compact optical transceiver used in optical communications for both telecommunication and data communications applications. Due to its compact, hot pluggable characteristics, SFPs are becoming a very popular choice for various applications. The small-chassis Magnum 6KQ is designed for industry-standard Gb-SFPs and Gb-SFPCU (copper) for user selection of the SFP gigabit media type as desired.

All SFPs used in Magnum 6KQs are compliant with the industry standard Multi-Source Agreement (MSA) ensuring compatibility with a wide range of networking kit.

Bail clasp

TX

RX

Side View   ---Duplex LC connector --   Front view

Note: It is highly recommended to remove the fiber cable first before removing the SFP transceiver for any reason. Not removing the fiber cable first can damage the fiber cable, cable connector or optical interfaces. It is advised not to remove and insert a SFP transceiver frequently as this may shorten its useful life.

Note: Always use an ESD wrist strap while handling the SFP transceivers since the SFP modules are static sensitive devices.

Note: The copper 1000BASE-T SFP transceiver port supports 1000Mb only. It is recommended to use a straight-through RJ-45(4-twisted pair) connection while connecting to any Server/workstation. While connecting with any Switch/repeater or other device, it is recommended to use Crossover RJ-45 (4-twisted pair) category 5 or higher cabling. The maximum length supported on copper 1000BASE-T is 100mts (328 ft.).

The various SFPs transceivers supported by GarrettCom 6KQs D slot are-

Module Model#	Gigabit
Gb Modules, fixed ports--SFP	
6KQ-2GSFP	2 SFP
6KQ-2GCU	2 CU
6KQ-2GSFPCU	1SFP, 1CU
6KQ-1GSFP	1 SFP
6KQ-1GCU	1 CU
Gb SFP fiber optic transceivers	
SFP-SX	Gb SX, 850nm wavelength, 500 m distance
SFP-LX10	Gb LX, 1310nm wavelength, 10km dist
SFP-LX25	Gb LX, 1310nm wavelength, 25km distance
SFP-ZX40	Gb ZX, 1550nm wavelength, 40km distance
SFP-ZX70	Gb ZX, 1550nm wavelength, 70km distance

3.2.6a   Connecting Fiber Optic Cable to SFP Transceivers

1.   Before connecting the fiber optic cable, remove the protective dust caps from the tips of the connectors on the PM. Save these dust caps for future use.

2.   Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

Note: One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the

fiber optic segment.

3. Find the Transmit (TX) and Receive (RX) markings on the SFP transceiver to
        verify the top side of it. Some of the transceiver marks arrow sign for up.

4. Position the SFP transceiver correctly before insertion, and then insert the SFP
transceiver carefully, until the transceiver connector snap into the place in the socket
connector.

5. Connect the Transmit (TX) port on the Magnum PM to the Receive (RX) port of the
remote device. Connect the Receive (RX) port on the PM to the Transmit (TX) port of
the remote device.

The LINK LED on the front of the PM will illuminate and turn Green, when a proper
connection has been established at both ends (and when power is ON in the unit). If
LINK is not lit or OFF after cable connection, the normal cause is improper cable

polarity. Swap the fiber cables at the PM
connector and also check the connectivity on
the target device to remedy this situation.

Reconfigure or reboot both the device if
required.

If connected properly, you can check via
(MNS-6K)software too for verification the
validity of SFP Gigabit ports.

Make sure Rel 3.6 or higher firmware is
loaded on the 6KQ switches to support the
SFP transceivers.

3.3   DIN-Rail Mounting the Magnum 6KQ

The Magnum 6KQ is designed for use in a "factory floor" industrial
environment. It is available with optional DIN-Rail brackets to mount it securely in a
metal factory floor enclosure, maintained vertically for proper convection cooling of the
unit. The Magnum 6KQ requires one DIN-Rail mounting clip or latch for secure
mounting. These may be ordered as Model # DIN-RAIL-6KQ. See a 6KQ viewed from
the side, at the left, with model DIN-RAIL-6KQ in place on the unit.

The Din Rail Latching clips are mounted on the upper side corners of the 6KQ unit. Two threaded holes are provided on the sides of 6KQ for DIN-Rail mounting purposes. See side view at the left. The required two screws are included with the DIN-Rail brackets, and are no.10-32 X 3/8 PHIL. PAN w/star washer. The two heavy-duty Din-Rail latches are designed as if that they can be manually accessed from the top when the 6KQ is installed on a DIN Rail.

To install the 6KQ with the DIN-Rail brackets and latches attached to it, hold the 6KQ in the side vertical position with the bottom out, and with the top moved in toward the DIN-Rail. Position the latches over the top of the DIN-Rail. Then, snap the latches into holding position by moving the bottom of the 6KQ inwards to a vertical position. The DIN-Rail latches and brackets are heavy duty, and will hold the 6KQ securely in position, even with cabling attached to the unit.

To release the 6KQ from the DIN-Rail mounting, press the top of the two DIN-Rail latches down simultaneously to release the 6KQ so that it can be dismounted by pulling the bottom out. Once the bottom of the 6KQ is rotated out, the DIN-Rail latch is not engaged and the 6KQ can be moved up and out, free of the DIN-Rail mounting.

The picture in Section 3.3 shows vertical mounting of Magnum 6KQ as it about to be mounted on a DIN-Rail track for proper convection cooling of the unit. Note that there is air space in the rear, as the 6KQ unit is held out from the rear of the panel by the mounting brackets. The 6KQ design uses the case for cooling (patent pending), and needs to be mounted vertically with air flow space around it in the front, rear, and sides.

The DIN-Rail mounting brackets and latches are optional and need to be ordered as separate items, e.g Model # DIN-RAIL-6KQ

3.3.1   Mounting Dimensions for 6KQ with metal brackets

Each Mangum 6KQ is supplied with metal mounting brackets and screws to mount the unit securely on a panel or wall. It is recommended to mount the 6KQ vertically, as shown below, for proper cooling and long-life reliability. It is also advisable to mount the unit with space for air movement around the top and the sides, typically a minimum of 1 inch.

Note that the metal brackets supplied hold the back of the 6KQ unit out from the panel or wall behind it, creating a rear space of about ¼ inch or 1cm. This allows

air circulation and cooling of the rear part of the case.

For best cooling of the 6KQ, attach the metal brackets to metal (rather than wood or plastic). Attaching to metal helps conduct heat away from the 6KQ through the metal brackets and into the metal support structure.

Since the 6KQ has special internal thermal techniques (patent pending) to move the heat generated by the electronic components inside into the case, the case may be quite warm to the touch during normal operation.

RJ LOCATIONS
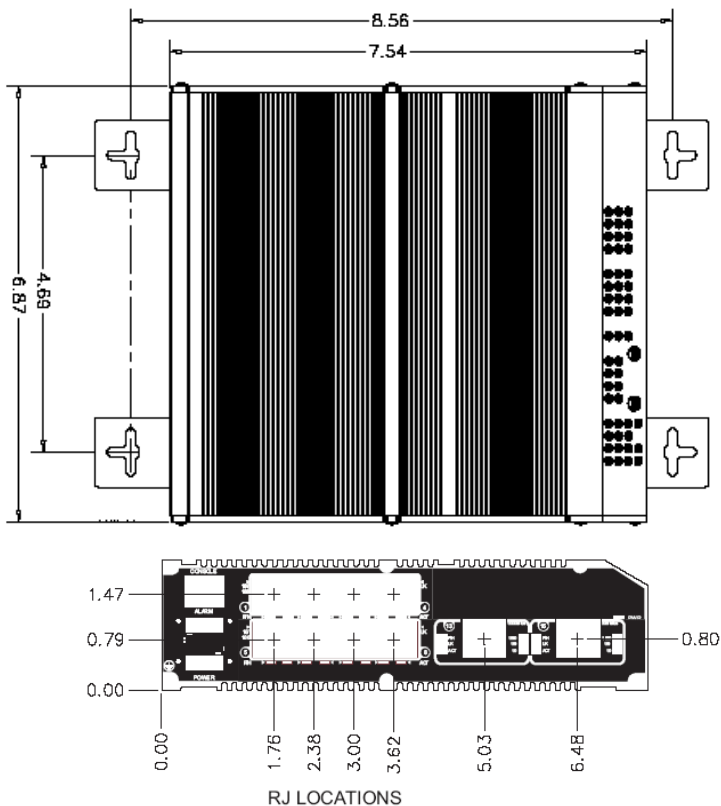
The unit is mounted using the brackets as shown in the illustration above. The spacing for the mounting screws into the supporting wall or panel is a rectangle 21.74 x 11.91 cm (8.56 x 4.69 inches) center-to-center.

3.4   Powering the Magnum 6KQ Managed Field Switch

The DC internal power supply supports installation environments where the DC voltage is from 18 to 150 volts depending on the model selected. The power

consumption will range from about 20 up to 35 watts, depending on the port quantity and types in the configuration.. When connecting the Ethernet cabling, there is no need to power down the unit. Individual cable segments can be connected or disconnected without concern for power-related problems or damage to the unit.

Power input options are available to suit the 6KQ Switches to special high-availability communications and/or heavy industrial-grade applications, including:

* -48VDC, 24VDC and 125VDC with single DC input,
* -48VDC, 24VDC and 125VDC with dual-source DC input

External AC power supplies are optional, see Section 1.2, Ordering Information.

See the Appendices of this manual for more details. Use an RFQ for other variations.

3.5   Alarm Contacts for monitoring internal power, and Software Traps

The Alarm Contacts feature, standard on Magnum 6KQ's, provides two Form C Normally Closed (NC) contacts to which the user can attach two sets of status monitoring wires at the green terminal block. When this option is present, the terminal block for Alarm Contacts is part of the Power Input panel in the 6KQ case. The DC power input connection is in the same panel.

The first NC Alarm Contact (top position, switch vertically mounted) is a "Software Alarm", operated by user settings in the MNS-6K software. The user can disable the Software Alarm feature with a software configuration command if desired. When the Software Alarm is enabled, the Form C Normally Closed (NC) contact is held close during normal software operation. A user-defined software malfunction, such as an SNMP Trap or a Software Security violation or an S-Ring Fault, causes the contact to open and thus triggers an alarm in the user's monitoring system

The second NC Alarm Contact is held closed when there is power on the main board inside of the Switch. This provides a "Hardware Alarm" because the NC contacts will open when internal power is lost, either from an external power down condition or by the failure of the power supply inside of the Magnum Switch.

Useful info. about Alarm contacts:

1. There are four terminal blocks (1,2,3,4) provided next to the DC power supply
2. The top two pins (1,2) are software operated
3. The bottom two pins (3,4) are hardware operated
4. These are both NC (normally closed) relays

Relay Contacts

5. The switch's software operation needs to be enabled and set to get the Alarm traps. For detailed information about the Software Alarm and software control of SNMP alarm traps, please reference the Magnum MNS-6K Software User Manual. (Chapter 19).

The Alarm Contacts are on the front left area (next to the DC power source) of the Magnum 6KQ unit and are green in color as shown in the picture.
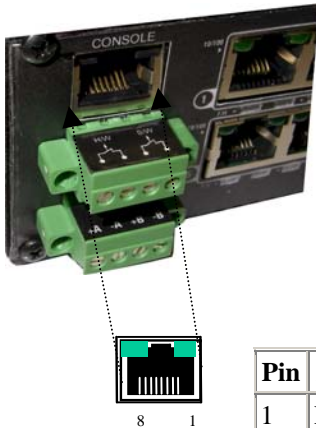
3.6   6KQ Port Module (6KPM) Installation

Magnum 6KQ Switches are normally received from the factory with all required 6K Port Modules installed.

NOTE: There may be situations where the 6K PMs need to be added or replaced. Any change in configuration of the modules can be done only via factory installation. There is no field upgrade option for 6KQ port modules. Please contact Tech Support (support@garrettcom.com) / RMA(rma@garrettcom.com) for changing modules.

The 6KQ port modules are not compatible with or inter-changeable with the other Magnum 6K-Family Switches' PMs, which use larger (typically 8-port) modules.

3.7   Connecting a Management Console Terminal to Magnum 6KQ (Serial-RJ45 Console Port)

The serial console port on the Magnum 6KQ is different from other 6K-family switches. The Serial RJ-45 port, as shown in the picture, requires an 8-pin RJ-45 male connector to have the proper communication. (Note - the serial RJ-45 console port on the Magnum 6KQ is compatible with Cisco-type RJ-45 console port cables).

The Serial port pin-out for the RJ-45 console port used on Magnum 6KQ

8 pin RJ45 female connector at the Magnum 6KQ front panel

Female connector

Pin	Name	Description	Dir
1	RTS	Request To Send	OUT
3	TXD	Transceiver Data	OUT
4	GND	Ground	-
5	GND	Ground	-
6	RXD	Receive Data	IN
8	CTS	Clear To Send	IN

Pin-out info for 6KQ (RJ-45 female connector).

Front

8 pin RJ45 male connector at the cables

Male connector

The Hyper terminal configuration is exactly the same as all other 6K-Family managed switches. Please check the following URL for details-
http://www.garrettcom.com/techsupport/software/userguides/mns6k_CLI.pdf
NOTE: The console RJ-45-Serial cable may be ordered from the GCI factory, using the model number and description here:
CONSOLE-CBLQD- Console attachment cable serial null-modem cable with one side RJ-45 for the 6KQ and a male DB-9 Female connector on the other end.
CONSOLE-CBLQU- Console attachment cable serial null-modem cable Combo with one serial- RJ-45 for the 6KQ side and a USB cable connector option on the other end (e.g computer).

NOTE for Power Substations: *In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the serial RJ-45console ports are intended for temporary connectivity to other equipment such as PCs. Since the console port connection is temporary, it is excluded from IEEE 1613 packet-loss testing per the 1613 standard-defined test procedure.*

4.0   OPERATION

This chapter describes the functions and operation of the Magnum 6KQ Switch.

4.1   Switching Functionality

A Magnum 6KQ provides switched connectivity at Ethernet wire-speed among all of its ports. The Magnum 6KQ supports10/100Mbs for copper media and 10 or 100Mb separate traffic domains for fiber ports to maximize bandwidth utilization and network performance. All ports can communicate to all other ports in a Magnum 6KQ, but local traffic on a port will not consume any of the bandwidth on any other port.

The Magnum 6KQ units are plug-and-play devices. There is no software configuring necessary to be done for basic operation at installation or for maintenance. The only hardware configuration settings are user options for an UP-LINK Switch (resides inside the unit) on the 6KQ-RJ45. There is an optional Half / Full duplex mode and 10Mbps or 100Mbps selection for the switched ports which must be configured through MNS software per unit as per the requirement. The internal functions of both are described below.

Filtering and Forwarding

Each time a packet arrives on one of the switched ports, the decision is taken to either filter or to forward the packet. Packets whose source and destination addresses are on the same port segment will be filtered, constraining them to that one port and relieving the rest of the network from having to process them. A packet whose destination address is on another port segment will be forwarded to the appropriate port, and will not be sent

to the other ports where it is not needed. Traffic needed for maintaining the un-interrupted operation of the network (such as occasional multi-cast packets) is forwarded to all ports.

The Magnum 6KQ Switches operate in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Address Learning

All Magnum 6KQ units have address table capacities of 4K node addresses suitable for use in larger networks. They are self-learning, so as nodes are added, removed or moved from one segment to another, the 6KQ Switch automatically keeps up with node locations.

An address-aging algorithm causes least-used addresses to fall out in favor for frequently-used addresses. To reset the address buffer, cycle power down-and-up.

4.2   Status LEDs

For Magnum 6KQ models (/6KQ) :

PWR   **:** Power LED, ON when external power is applied to the unit.
LK   **:**   Steady ON, Link status for 10 Mbps and 100Mbps operation.
ACT   **:** ON with port activity for 10 Mbps and 100Mbps operation.
F/H   **:** Full / Half duplex LED, ON when the port is running full duplex,
                           OFF for half duplex.
100/10   **:** Speed LED, ON when the speed is 100Mbps , OFF when the
                           speed is 10 Mbps

4.3   Auto-Cross(MDIX) and Auto-negotiation, for RJ-45 ports

The RJ-45 ports independently support auto-cross (MDI or MDIX) in auto-negotiation mode and will work properly with all the other connected devices with RJ-45 ports whether they support Auto-negotiation (e.g 10Mb Hub, media converter) or fixed mode at 10Mb or 100Mb Half/Full Duplex(managed switch) or not. No cross-over cable is required while using the 6KQ's copper port to other devices. Operation is according to the IEEE 802.3u standard.

The Managed 6KQ's Fast Ethernet copper ports can be set for either fixed 100Mb speed or for 10/100 F/H N-way auto-negotiation per the IEEE802.3u standard. The selection is made via MNS software. The factory default setting is for auto-negotiation. At 10Mb or 100Mb-fixed speed, the user may select half- or full-duplex mode by MNS Software for each RJ-45 port separately. For detail information **See Section (2.2.9 at page no.14) of**

this manual to access the "6K-MNS(Rel 3) Software user guide"

One frequently-used application for the Managed Magnum 6KQ Switch copper ports is to connect one of them using a fiber media converter to another Switch in the network backbone, or to some other remote 100Mb device. In this case, it is desirable to operate the fiber link at 100Mb speed, and at either half- or full duplex mode depending on the capabilities of the remote device. Standard commercially available Fast Ethernet media converters mostly do not support auto-negotiation properly, and require that the switched port to which they are connected be at the 100Mb fixed speed. Attachments to a 10/100 auto-negotiation port typically will not work properly. The 6KQ Switch's RJ-45 ports handle this situation by configuring the ports as per desired through MNS software port settings and can check the port status of each port after the change.

When Magnum 6KQ RJ-45 copper ports are set for auto-negotiation and are connected to another auto-negotiating device, there are 4 different speed and F/H modes possible depending on what the other device supports. These are: (1) 100Mb full-duplex, (2) 100Mb half-duplex, (3) 10 Mb full-duplex and (4) 10 Mb half-duplex.

The auto-negotiation logic will attempt to operate in descending order and will normally arrive at the highest order mode that both devices can support at that time. (Since auto-negotiation is potentially an externally controlled process, the original "highest order mode" result can change at any time depending on network changes that may occur). If the device at the other end is not an auto-negotiating device, the 6KQ's RJ-45 ports will try to detect its idle signal to determine 10 or 100 speed, and will default to half-duplex at that speed per the IEEE standard.

General information -

> **Auto-negotiation per-port for 802.3u-compliant switches occurs when:**
>
> -- the devices at both ends of the cable are capable of operation at either 10Mb or 100Mb speed and/or in full- or half-duplex mode, and can send/receive auto-negotiation pulses, and . . .
>
> -- the second of the two connected devices is powered up*, i.e., when LINK is established for a port, or
>
> -- the LINK is re-established on a port after being lost temporarily.

- **NOTE** – *Some NIC cards only auto-negotiate when the computer system that they are in is powered. These are exceptions to the "negotiate at LINK – enabled" rule above, but may be occasionally encountered.*

When operating in 100Mb half-duplex mode, cable distances and hop-counts may be limited within that collision domain. The Path Delay Value (PDV) bit-times must account for all devices and cable lengths within that domain. For Magnum 6KQ Fast Ethernet switched ports operating at 100Mb half-duplex, the bit time delay is 50BT.

4.4   Flow-control, IEEE 802.3x standard

Magnum 6KQ Switches incorporate a flow-control mechanism for Full-Duplex mode. The purpose of flow-control is to reduce the risk of data loss if a long burst of activity causes the switch to save frames until its buffer memory is full. This is most likely to occur when data is moving from a 100Mb port to a 10 Mb port and the 10Mb port is unable to keep up. It can also occur when multiple 100Mb ports are attempting to transmit to one 100Mb port, and in other protracted heavy traffic situations.

Magnum 6KQ Switches implement the 802.3x flow control (non-blocking) on Full-Duplex ports, which provides for a "PAUSE" packet to be transmitted to the sender when the packet buffer is nearly filled and there is danger of lost packets. The transmitting device is commanded to stop transmitting into the 6KQ Switch port for sufficient time to let the Switch reduce the buffer space used. When the available free-buffer queue increases, the Switch will send a "RESUME" packet to tell the transmitter to start sending the packets. Of course, the transmitting device must also support the 802.3x flow control standard in order to communicate properly during normal operation.

Note: When in Half-Duplex mode, the 6KQ Switch implements a back-pressure algorithm on 10/100 Mb ports for flow control. That is, the switch prevents frames from entering the device by forcing a collision indication on the half-duplex ports that are receiving. This temporary "collision" delay allows the available buffer space to improve as the switch catches up with the traffic flow.

4.5   Power Budget Calculations for 6KQ PM's with Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = $P_T(min) - P_R(min)$

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the "Cable Loss" for 62.5/125 and 50/125μm (M.m) is 2.8 dB/km,

and the "Cable Loss" for 100/140 (Multi-mode) is 3.3 dB/km,

and the "Cable Loss" for 9/125 (Single-mode) is 0.5 dB/km

and the "Cable Loss" for 9/125 (Single-mode) is 0.4 dB/km (LXSC25)

and the "Cable Loss" for 9/125 (Single-mode) is 0.25 dB/km

(LXSC40)

and the "Cable Loss" for 9/125 (Single-mode) is 0.2 dB/km (LXSC70)

The following data has been collected from component manufacturer's (Agilent's and Lucent's) web sites and catalogs to provide guidance to network designers and installers.

Fiber Port Module	Speed, Std.	Mode	Std. km fdx (hdx)	Wave-length nm	Cable Size μm	X'mitr Output P_T, dB	R'cvr Sens. P_R, dB	Worst OPB, dB	Worst* distance Km, fdx	typical OPB, dB	typical* distance Km, fdx
6KP4V-**F10ST**	**10Mb** FL	**Multi-Mode**	**2** (2)	850	62.5/125	-15.0	-31	14	**5**	17	**6**
					100/140	-9.5	-31	19.5	**5.9**	23.5	**7**
					50/125	-19.5	-31	19.5	**3.4**	13.5	**4.8**
6KPV-**MST, MSC**	**100Mb** FX	**Multi-mode**	**2** (0.4)	1300	62.5/125	-20	-31	9.0	**3.0**	14	**5**
					50/125	-23.5	-31	5.5	**2.0**	12	**4**
6KPV-**SSC**	**100Mb** FX	**Single-mode**	**18+** (0.4)	1300	9/125	-15	-31	14	**28**	17.5	**35**
6KPV-**SSCL**	**100Mb** FX	**Single-mode**	**40** (0.4)	1300	9/125	-5	-34	29	**58**	32.5	**65**
6KPV-**MTRJ**	**100Mb** FX	**Multi-mode**	**2** (0.4)	1300	62.5/125	-20	-31	9.0	**3.0**	15.8	**5.5**
					50/125	-23.5	-31	5.5	**2.0**	12.2	**4.0**
6KPV-**MLC**	**100Mb** FX	**Multi-mode**	**2** (0.4)	1300	62.5/125	-19	-31	12	**4**	16	**5.7**
6KPV-**SLC**	**100Mb** FX	**Single-Mode**	**15+** (0.4)	1310	9/125	-15	-28	11	**22**	-	**-**
Magnum **SFP-LX10**	1000 Mb FX (Gigabit)	Single-	10	1310	9/125	-10.0	-22	10	**22**	11	**24**
Magnum **SFP-LX25**	1000 Mb FX (Gigabit)	Single-	25	1310	9/125	-3.0	-21	16	**40**	18	**45**
Magnum **SFP-LX40**	1000 Mb FX (Gigabit)	Single-	40	1550	9/125	-5.0	-22	15	**60**	17	**68**
Magnum **SFP-LX70**	1000 Mb FX (Gigabit)	Single-	70	1550	9/125	-2.0	-22	18	**90**	20	**100**

***Not**e: The use of either multi-mode or single-mode fiber to operate at 100Mbps speed over long distances (i.e., in excess of approx. 400 meters) can be achieved **only** if the following factors are both applied:*

- *The 100Mb fiber segment must operate in full-duplex (FDX) mode, i.e. the full-duplex (factory default) setting for 100Mbps fiber ports must be used, and*

- *The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.*

(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)

5.0   Introduction - Magnum 6KQ Managed Field Switch Port Modules

This chapter describes each Port Module (PM), including appearance, functionality, and status displays.

5.1   Inspecting the Package and Product

This section applies only to PMs shipped as separate items, i.e., 6KQ PMs not factory installed in a Magnum 6KQ PM slot.

Examine the shipping container for obvious damage prior to installing a 6KQ PM; notify the carrier of any damage you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

1 or more 6KQ units (or 6KQ) PMs

Installation instructions, with illustrations

Remove the 6KQ PM(s) from the shipping container. Be sure to keep the shipping container should you need to ship any of the PMs separately at a later date. In the event there are items missing or damaged, contact your supplier. If you need to return the unit, use the original shipping container if possible. Refer to Chapter 5 for specific return procedures.

5.2   6KPM Module Description

An important feature of the Magnum 6KQ is the use of Port Modules for flexible mixed-media connectivity to RJ-45 and fiber media. Since the Magnum 6KQ Switches have dual-speed capability for copper ports, the 1, 2, 3, or 4-port interfaces are designed to support all standard Ethernet media types at 10 or 100 or 1000Mps speed. Each 6KQ PM provides a wide selection of connecting Ethernet media segments with all similar or combo connector types.

Note: <u>The 6KQ Port modules are not identical to the port modules used in other 6K products such as the 6K25e and 6K16V.   For information about other 6K products, please see the applicable manual. For a list of 6KQ Port Modules, refer to Section 1.2</u>

Each 6KQ Port Module (PM) is individually described in the following sections.

5.2.1   6KQF-2MST, 2@100Mb multi-mode FX-ST "twist lock" Combo Module

The Magnum 6KQ-2MST is two port ST fiber module at 100MB. The module is equipped with dual-mode ST-type connectors and dual speed copper ports. The ST-connector functions as a fiber optic transceiver to support 100BASE-FX network segments. When installed in a Magnum 6KQ Managed Switch, the copper port supports the standard distance 100m on each port and the fiber port supports fiber optic cable distances up the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.
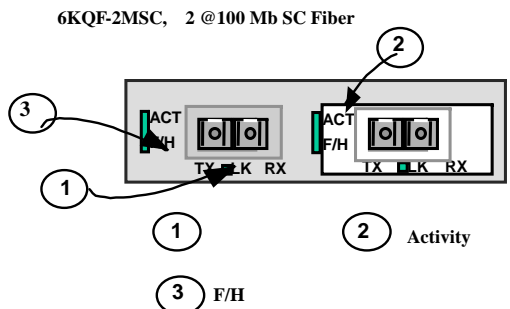

6KQF-   2 @100 Mb ST Fiber

Each port has an Activity (ACT) LED indicating packets being received. A Link (LK) LED indicates proper connectivity with the remote device when lit, and FDX/HDX LED to indicate full-duplex mode when lit (half-duplex when off).
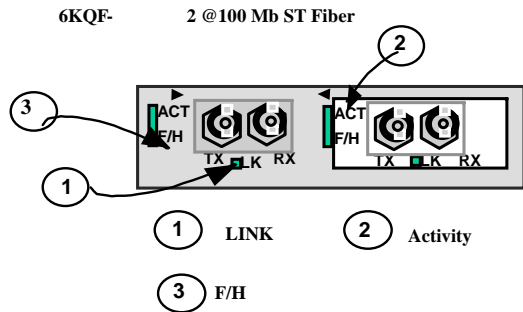
5.2.1a   6KQ2-10ST, 2@10Mb multi-mode FX-ST "twist lock" Module

The 6KP6-RJ10ST is a two port Fiber module that looks similar to the 100MbFiber module with the exception of 10Mb speed at the ST fiber module. The ST-connector functions as a fiber optic transceiver to support 10BASE-FX network segments. When installed

6KQF-2MSC,   2 @100 Mb SC Fiber

in a Magnum 6KQ Managed Switch, the fiber port supports fiber optic cable distances up

the IEEE-standard 10Mbps distance limits, i.e., typically 2km at full-duplex and half-duplex.

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and an FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off).

5.2.2. 6KQF-2MSC, 2@100Mb multi-mode FX-SC "snap-in" Fiber connector
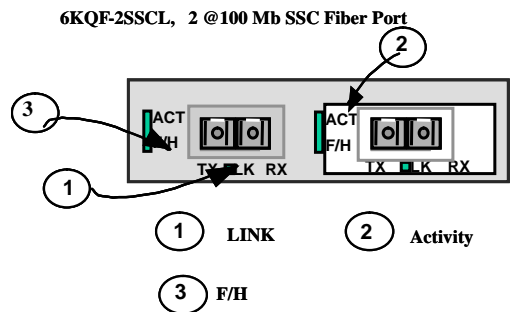
The Magnum 6KQF-2MSC is two port module equipped with 2 multi-mode 100Mbps fiber optic transceivers. This is similar to the 6KQF-2MST. It has the same LEDs indicating port activity (ACT), Link (LK), and FDX / HDX and 10/100 operation, as well as the same face-plate lettering. The difference is that the 6KQF-2MSC is equipped with SC-type "snap-in" fiber port connector instead of an ST-type.

5.2.3   6KQF-2SSCL, 2 Ports @100Mbps single-mode FX-SC-type, Sgl.M

The Magnum 6KQF-2SSCL is also a Fiber module equipped with 2 Single-mode (Long Reach) SC-type connectors. It provides a long reach Fiber function in one module to the 6KQ Switches, supporting 100Mb single-mode (Long-Reach) fiber network segments.
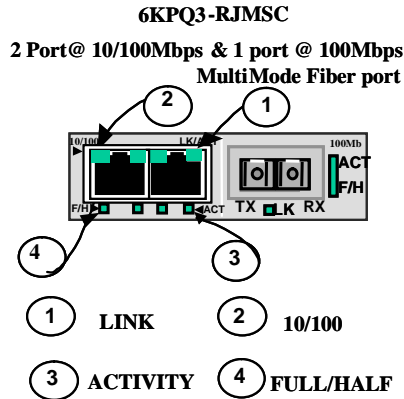
The 6KQF-2SSCL, when installed in a Magnum 6KQ Switch, supports single-mode fiber cable lengths of as much as 40+ Km (see Power Budget, Section 4.5). Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and a FDX/HDX LED indicating full-duplex mode when lit (or half-duplex when off).

6KQF-2SSCL, 2 @100 Mb SSC Fiber Port

5.2.4   6KQ3-RJMSC "COMBO" 2@ 10/100Mbps RJ-45 Ports and 1@100Mbps FX-SC-type, "snap-in" connector

The Magnum 6KPQ-RJMSC is also a Combo module equipped with 2 dual speed copper ports and 1 Multi-mode SC-type connector. It provides an advantage through combining copper and Fiber functions in one module that

6KPQ3-RJMSC

2 Port@ 10/100Mbps & 1 port @ 100Mbps MultiMode Fiber port

supports two copper and one multi-mode fiber network segments.

The 6KQ3-RJMSC, when installed in a Magnum 6KQ-Field Switch, operates on copper at 100m distances. The Fiber is multi-mode and cable lengths can be as much as 2 Km (see Power Budget, Section 4.5)

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates 100Mbps speed when lit and at 10Mbps speed when off.

5.2.5 6KQ4-MT, 4 @100Mb multi-mode FX , MTRJ Small-Form-factor

Magnum 6KQ4-MT is a multi-mode fiber optic 4-port module equipped with a small-form-factor MTRJ-type connector. It looks almost like an RJ-45 port, but it is black in color. The MT-RJ's small compact size connector and ease of connection make it a good choice for 100Mbps "fiber-to-the-desktop" Ethernet connectivity. When installed in a Magnum 6KQ Switch, it supports fiber optic cable distances up the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex or half-duplex.

6KQ4-MT, 4 @100 Mb MTRJ Fiber Port
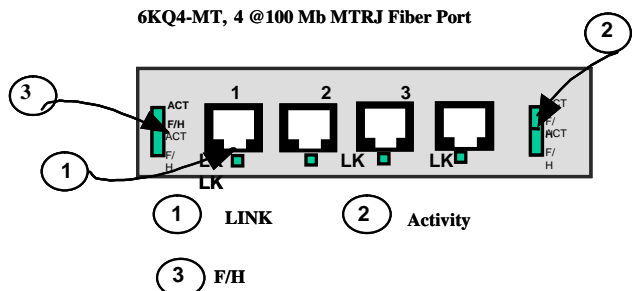
The functionality of this 100BASE-FX multi-mode 4-port module is essentially the same as the ST and SC-types. It has the same LEDs per port indicating port activity (ACT), Link (LK), and FDX or HDX operation.

5.2.6   6KQ4-RJMT, "COMBO" 2@ 10/100Mbps RJ-45 and 2@100Mb multi-mode FX , MTRJ Small-FF

6KQ4-RJMT
**2 Port@ 10/100Mbps & 2 port @ 100Mbps MTRJ Fiber port**

The Magnum 6KQ4-RJMT Module is a combo module with copper and fiber (Small Form Factor) MTRJ type ports. The small size of MTRJ connectors provides an advantage of placing more ports on one module. The 6KQ4-RJMT is equipped with Two 10/100 RJ-45 ports and Two MTRJ fiber ports.
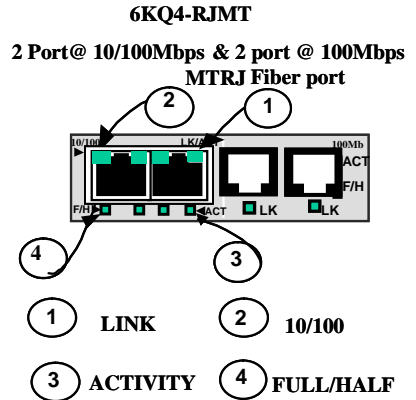
When installed in a Magnum 6KQ Switch, it supports the standard distances as per the media. Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates 100Mbps speed when lit and at 10Mbps speed when off.

### 5.2.7   6KQ4-MLC, 4 ports @ 100Mbps multi-mode LC connector <u>SFF</u>

Magnum 6KP8-MLC is a Four-port multi-mode fiber LC connector "small-form-factor" used primarily in 100Mbps fiber-to-the-desktop links. When installed in a Magnum 6KQ Switch, it supports fiber optic cable distances up to the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.

6KQ4-LC, 4 @100 Mb LC Fiber Port
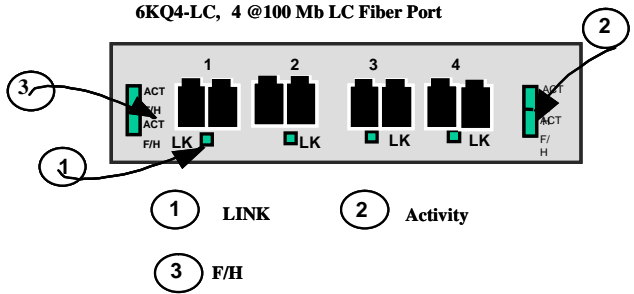
The compact size of the LC Connector reduces the size of wiring panels in wiring closets while providing the advantage of "future-proof" fiber optic technology.

The cable end is a "plug-in" connector with both fiber strands terminated in one housing that cannot be improperly inserted. Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and a FDX/HDX LED indicating full-duplex mode when lit (or half-duplex when off).

6KQ4-RJMLC

2 Port@ 10/100Mbps & 2 port @ 100Mbps MLC   Fiber port

5.2.8   6KQ4-RJMLC, Combo 2@ 100Mbps multi-mode -LC small-form factor and 2@ 10/100 Mbps RJ-45 Connector
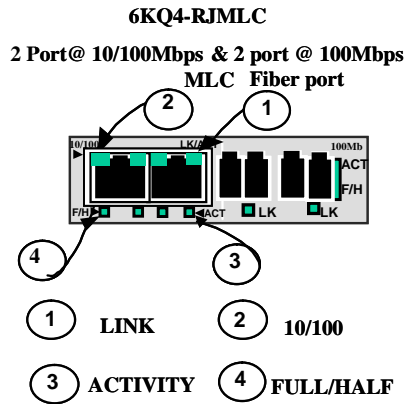
The Magnum 6KQ4-RJMLC module is a combo module with a combination of copper and mm Fiber (Small Form Factor) LC-type ports. The small size of LC connectors allows more ports on one module. The 6KQ4-RJMLC is equipped with two 10/100 RJ-45 ports and two LC multi-mode fiber ports.

When installed in a Magnum 6KQ Switch, it supports the standard distances as per the media. Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates 100Mbps speed when lit and at 10Mbps speed when off.

5.2.9   6KQ4-RJ45 (Twisted Pair), 10/100Mb, 4-Port

The 6KQ4-RJ45 module supports Ethernet twisted pair segments of any standard length. It is equipped with a Four-port RJ-45 connector, and offers 10/100 full / half-duplex auto-negotiating capability on each port. The RJ-45 connector is shielded to minimize emissions and will allow both unshielded twisted pair (UTP) and shielded twisted pair (STP) cable connections.

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off), and a

6KQ4-RJ45

4 Ports@ 10/100Mbps, RJ-45
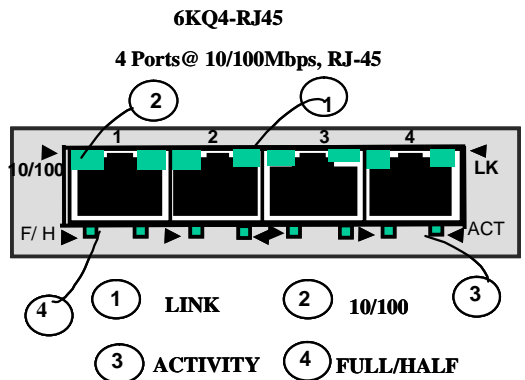
"10/100" LED indicating 100Mb when lit (or 10 Mbps when off).

> **Note:** The 10/100 RJ-45 ports are supported with Auto-negotiation and Auto-crossover (MDIX), which allow the RJ-45 ports to automatically Link with any RJ-45 device and eliminate the use of cross-over cable.

NOTE: **for Power Substations:**   *In support of the IEEE 1613 Class 2 standard, GCI advises that, for substation applications, the RJ-45 ports are intended for connectivity to other communication equipment such as routers or telecommunication multiplexers installed in close proximity (i.e., less than 2 meters or 6.5ft) to the 6KQ. It is not recommended to use these ports in substation applications to interface to field devices across distances which could produce kigh (greater than 2500V) levels of ground potential rise (GPR) during line-to-ground fault conditions. The 6KQ passes the 1613specifications for zero packet loss with fiber ports & with RJ45 ports used as indicated here.*

### 5.2.10 PoE power-pass-through, Base unit Model 6KQP-48VDC, 10/100Mb 4-port

See Section 2.2.3 for basic PoE ports information.

The LEDs on PoE ports are slightly different compared to regular (non-PoE) RJ-45 modules.. When the PoE port is in use, the PoE LED is ON when connected properly to a 803.af compliant PD device on that port. When non-PoE devices are connected, the PoE LED is OFF. Operation of Ethernet data traffic is not affected by PoE.

LINK and ACTIVITY LEDS are combined on the PoE modules into one LED that is marked as LINK/ACT.

PoE LEDs Summary
- For PoE devices, each RJ-45 PoE port supports only 802.3af complaint devices. The PoE LED is ON when the attached PD is drawing power from the port.
- For non-PoE devices connected, the PoE port will act as a normal RJ-45 port and the PoE LED is OFF. No power is being sent out from the port.
- The PoE ports in Magnum 6K's with 48VDC power input act as a pass-through, so the 48VDC power source must be strong enough to provide power to the 6K switch and to all the 4 RJ-45 ports with PD devices connected (up to 15 watts per PoE port).
- In the case where the 48VDC power in not internally connected and no power is coming to the PoE ports for some reason, all the PoE port LEDs are ON simultaneously to indicate a trouble condition. The ports will still operate properly for data traffic.

6KQ-2GSFPCU

1 Port@ 10/100/1000Mbps, 1 Port at 1000Mb SFP

② LINK   ② 10/100/1000

③ ACTIVITY   ④ FULL/HALF
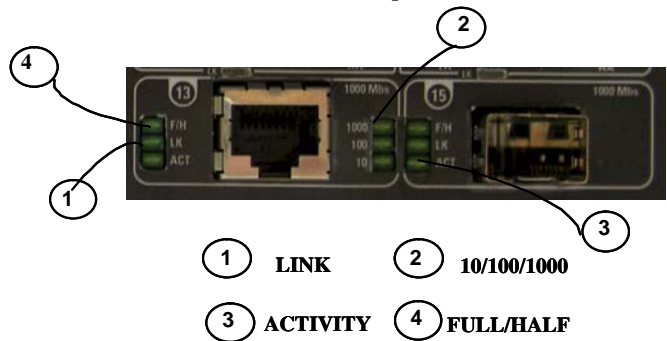
5.2.11   SFPs, Gigabit (1000Mbps) port modules

The Magnum 6KQ offers a Gigabit option with multiple choices of copper 10/100/1000Mbps or Gigabit SFP Fiber modules for the modular slot. While up to two Gigabit modules (maxm.) can be configured in the modular slot D only.

The 6KQ Modules provide a GBIC opening for insertion of industry-standard SFPs to provide Gigabit (Gb) media flexibility. SFP fiber Transceivers are available with both multi-mode (550m) at 850nm and single-mode at 1330nm (10, 25, 40, 70)km fiber options, and for Gigabit copper as well, with new models appearing often.

The 1000Mb Gigabit SFP fiber-port modules on the Magnum 6KQ are normally set (factory default) to operate at AUTO mode for best fiber distance and performance. Only two Gigabit ports can be configured on a Mangum 6KQ managed switch in slot D.

There are three LEDs provided on each SFP Gigabit port module. The SFP Gigabit fiber has LEDs that indicate LK (Link status) and ACT (receiving activity) when lit and F/H (on for Full and OFF for half duplex) for that port.

The copper Gigabit port supports 10/100/1000Mb speeds. The three LED's show the speed the connection has achieved. It is set as AUTO by default. All other LEDs are the same as the SFP fiber.

5.2.12 6KQ-BLNK

The 6KQ-BLNK is a blank face plate or cover plate that must be installed in any empty 6KQ PM slot to maintain proper cooling air flow, safety, etc. Two screws underneath the front panel hold the 6KQ-BLNK in place.

6.0   TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of a Magnum 6KQ Switch is a straightforward procedure (see INSTALLATION, Section 3.0). The operation is also straightforward and is discussed in Section 4.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum 6KQ Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

6.1   Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.

2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)

3. Make sure that DC power is properly attached to each Magnum 6KQ Switch unit. Use the PWR LEDs to verify each unit is receiving power.

4. If the problem is isolated to a network device other than the Magnum 6KQ Switch product, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Magnum 6KQ Switch and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 6KQ Switch unit or if unknown, contact GarrettCom, Inc.by fax, phone or email (*support@garrettcom.com*) for assistance.

6.2 When Calling for Assistance
Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:
    a. The nature and duration of the problem;
    b. Situations when the problem occurs;
    c. The components involved in the problem;
    d. Any particular application that, when used, appears to create the problem;
2. An accurate list of GarrettCom product model(s) involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.
3. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.
4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

6.3 Return Material Authorization (RMA) Procedure
All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, please use this URL - **https://rma.garrettcom.com/rma/rma_request_noaccount.php** to fill out the form. Please have the following information readily available:

Name and phone number of your contact person.
Name of your company / institution
Your shipping address
Product name
Serial Number (or Invoice Number)
Packing List Number (or Sales Order Number)
Date of installation
Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

6.4 Shipping and Packaging Information
Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.

3. GarrettCom is not responsible for your return shipping charges.

4. Ship the package to:

GarrettCom, Inc.

47823 Westinghouse Dr.

Fremont, CA 94539-7437

Attn.: Customer Service

APPENDIX A: WARRANTY INFORMATION

GarrettCom, Inc. warrants its products to be free from defects in materials and workmanship for a period of three (3) years from the date of shipment by GarrettCom.

During this warranty period, GarrettCom will repair or, at its option, replace components in the products that prove to be defective at no charge other than shipping and handling, provided that the product is returned pre-paid to GarrettCom.

This warranty will not be effective if, in the opinion of GarrettCom, the product has been damaged by misuse, misapplication, or as a result of service or modification other than by GarrettCom.

GarrettCom reserves the right to make a charge for handling and inspecting any product returned for warranty repair which turns out not to be faulty.

Please complete the warranty card as this acts as a product registration, and mail it to GarrettCom within two weeks of your purchase.

APPENDIX B : DC Power Input

B1.0   Specifications for Magnum 6KQ Switches, DC Power at 24V and – 48V and 125V DC Power input

Each Magnum Model 6KQ Managed Switch requires DC power input, at either 24VDC, -48VDC or 125VDC nominal. The wide range of DC power input types qualifies this product for use in 24VDC, -48VDC as well as 125VDC applications in different industries.

DC Power Terminals: "+", "-" are internally floating so that user may ground either
GND: ground wire connection to the 6KQ chassis screw

Power Consumption:
> 35 watts typical (for a fully loaded fiber model)
> 12 watts typical (for a small 4 port copper-only model)

24VDC Power Input nominal (18 to 36VDC range)
-48VDC Power Input nominal (36 to 60 VDC range)
**125VDC Power** Input nominal (88 to 150VDC range)

Standard 6KQ DC Power Input Terminal Block :   " -, GND, + "

See also Section 1.0, Technical Specifications, for the 6KQ base unit

B2.0   -48VDC, 24VDC and 125VDC POWER, THEORY OF OPERATION

The -48VDC, 24VDC and 125VDC power options are designed using diodes inside on each DC power input line behind the two external power connection terminals, so that the power from an external source can only flow
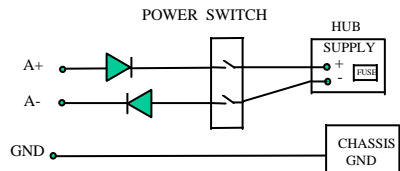
into the hub. This allows the Switch to operate only whenever DC power is correctly applied to the two inputs. It protects the Switch from incorrect DC input connections. An incorrect polarity connection, for example, will neither affect the Switch, its internal power supply, nor will it blow the fuse in the internal power supply.

B3.0   APPLICATIONS FOR DC POWERED ETHERNET SWITCHES

Magnum 6KQ Switches are easily installed in a variety of applications where -48VDC, 24, or 125VDC power is used as the primary power source. The DC power configuration capability provides an Ethernet networking solution utilizing a special power supply in switches with a proven track record.

The –48VDC solution is particularly useful in the telecommunication industry, where it is common for facilities to operate on -48VDC power. Such companies include regular and wireless telephone service providers, Internet Service Providers (ISPs) and

other communication companies. In addition, many high availability equipment services, such as broadcasters, publishers, newspaper operations, brokerage firms and other facilities often use a battery backup system to maintain operations in the event of a power failure. It is also frequently used for computer system backup, management and operations monitoring equipment.

The 24V and 125VDC options are particularly useful in the industrial environment, where it is common for facilities to operate on 24VDC or 125VDC power. The 125VDC options are mainly used in power utilities, such as electrical substations, electrical generating plants, etc. The 24VDC applications are mainly in heavy duty industrial automation such as factory floor, process plants, HVAC, military equipment, etc.

B4.0   6KQ, -48V, 24, 125VDC INSTALLATION

This section describes the proper connection of the -48VDC leads (or 24VDC / 125VDC leads) to the DC power terminal block on the Magnum 6KQ Switch. The DC terminal block on the Magnum 6KQ Managed Switch is located on the left front of the unit and is equipped with four (4) screw-down lead posts. The power terminals are identified as positive (+) and negative (-), and they are electrically floating inside the unit so that either may be grounded by the user if desired. The chassis is "earth" or ground (GND).

The connection procedure is straightforward. Simply insert the DC leads to the Switch's power terminals, positive (+) and negative (-) screws. The use of Ground (GND) connects to the Switch chassis screw provided under the DC terminal. Ensure that each lead is securely tightened.

NOTE: Always use a <u>voltmeter</u> to measure the voltage of the incoming power supply and figure out the +ve potential lead or -ve potential lead. The more +ve potential lead will connect to the post labeled "+ve" and the rest to the "-ve". The GND can be hooked up at the last.

When power is applied, the green PWR LED will illuminate.
Note: The GND should be hooked up first. The 6KQ unit has a floating ground, so the user may elect to Ground either + or = terminal to suit the customer's use.

Before connecting hot lines to the Terminal Block of –48VDC, 24VDC or 125VDC, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more "+ve potential". The more "+ve" voltage lead from 48V or –48V supply must be connected to the post labeled "+".

B4.1   UL Requirements for DC-powered units

1.   *Minimum 18AWG cable for connection to a Centralized DC power source.*
2.   *Minimum 14AWG cable for connection to a earthing wiring.*
3.   *Use only with Listed 10 A circuit breaker provided in building installation.*
4.   *"Complies with FDA radiation performance standards, 21 CFR subchapter J." or equivalent.*
5.   *Fastening torque of the lugs on the terminal block: 9 inch-pound max.*
6.   *Centralized DC Power Source cable securement, use at least four cable ties to*

secure the cable to the rac,k at least 4 inches apart, with the first one located within 6 inches of the terminal block.

B5.0   OPERATION

Operation of Magnum 6KQ Switches with the optional -48VDC, 24VDC and 125VDC dual-source power input is identical to that of the standard single-source DC-powered models.

B6.0   TROUBLESHOOTING

Please refer to Section 6.0 for troubleshooting

APPENDIX C: Internal DC Dual-Source Power Input Option
C1.0   SPECIFICATIONS - FOR MAGNUM 6KQ FIELD SWITCH

Power Supply (Internal, -48VDC Dual-Source)
DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"
GND: ground wire connection to the hub chassis screw
Input: Two separate sources, each at 36 - 60 VDC
Power Supply (Internal, 24VDC Dual-Source, model # Dual-Src-24V)
DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"
GND: ground wire connection to the hub chassis screw
Input: Two separate sources, each at 18 - 36 VDC
Power Supply (Internal, 125VDC Dual-Source, model # Dual-Src-125V)
DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"
GND: ground wire connection to the hub chassis screw
Input: Two separate sources, each at 88 - 150 VDC

With the exception of the dual DC input power connections and the power supply, all specifications and configuration options for the Magnum 6KQ -48VDC, 24VDC and 125VDC models with this Dual-Source option are identical to those listed in the *Magnum 6KQ Field Switches Installation and User Guide*, including Appendix B "Internal DC Power Supply Option"

C2.0   MAGNUM 6KQ, with -48VDC, 24VDC and 125VDC Dual-Source option

The 6KQ-Switch models with the internal -48VDC, 24VDC and 125VDC Dual-Source power supply are designed for installations where a battery plant is the power source, and where two separate power sources are utilized in order to increase operational uptime and to simplify maintenance.

The functionality of the Magnum 6KQ Switch -48VDC, 24VDC and 125VDC Dual-Source Option units is identical to the standard AC-powered models. Refer to the main sections of this *Installation and User Guide* for a detailed description of the Magnum 6KQ Switches.

C3.0   DUAL-SOURCE OPTION, THEORY OF OPERATION

The Dual-Source DC power option is designed using diodes inside of the chassis on each DC power input line. A diode is placed in each of the four input lines (behind the four external power connection terminals) so that power from an external source can only flow into the unit. This allows the unit to operate whenever DC power is correctly applied to either or both of the two inputs**.**
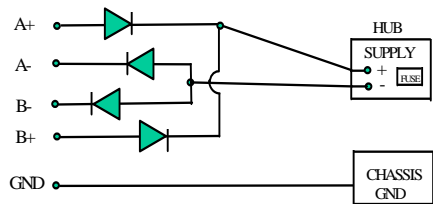
C4.0   FEATURES AND BENEFITS OF THE DUAL-SOURCE DESIGN

a)   The Switch unit can receive power from either input, "A" or "B". The hub will normally draw its power from the DC source with the highest voltage at a given time.
b)   The Switch unit will not allow power to flow from a higher voltage input to a lower voltage input, i.e. the two DC power sources are not mixed together by the hub.
c)   When one correct DC input is present, the Switch will receive power if the other DC input is absent, or even if it is connected with reverse polarity or shorted or grounded.
d)   Reverse polarity connections, if they should accidentally occur on either input, will not damage the Switch or power supply internally (nor will it blow the fuse in the internal power supply) because of the blocking action of the diodes. This is true even if one input connection is reversed while the Switch is operating from the other source.
e)   The Switch will not receive power (and will not work) when both inputs are simultaneously absent or are both incorrectly connected.

C5.0   INSTALLATION

This section describes the proper connection of the -48VDC, 24VDC and 125VDC dual source leads to the -48VDC, 24VDC & 125VDC power terminal block on the Magnum 6Ks Switch (shown in Figure to the right)

The -48VDC terminal block on the Magnum 6KQ Switch is located on the left front of the unit next to the Alarm terminal block and is equipped with five (5) screw-down lead posts. The primary terminals are identified as positive (A+),
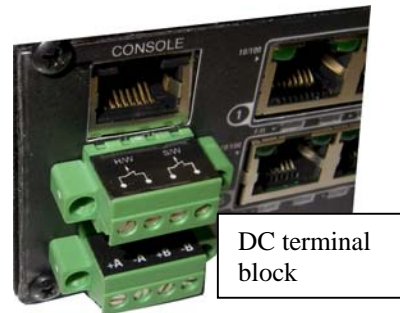
DC terminal block

Figure C5.0: DC Dual-Source, wiring connections to the External Terminal Block on a Magnum -48VDC with Dual-Source option

negative (A-), and the secondary power terminals as negative (B-), positive(B+). The chassis is "earth". The Dual Source terminal block for the 24, 48 and 125VDC are same.

Note: The GND should be hooked up first. The 6KQ unit has a floating ground, so the user may elect to Ground either + or = terminal to suit the customer's use. Before connecting hot lines to the Terminal Block of – 48VDC, 24VDC or 125VDC, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more

"+ve potential". The more "+ve" voltage lead from 48V or –48V supply must be connected to the post labeled "+".

The connection procedure is straightforward. Simply connect the DC leads to the Switch's power terminals, positive (+) and negative (-) screws. The use of Ground (GND) is optional; it connects to the Switch chassis. Ensure that each lead is securely tightened.

C5.1 UL Requirements
The following must be adhered to in order to conform to UL requirements:
1. *Minimum 18 AWG cable for connection to a Centralized DC power source.*
2. *Minimum 14 AWG cable for connection to earthing wiring.*
3. *Use only with Listed 10 A circuit breaker provided in building installation.*
4. *"Complies with FDA radiation performance standards, 21 CFR subchapter J." or equivalent.*
5. *Fastening torque of the lugs on the terminal block: 9 inch pound max.*
6. *Centralized DC Power Source cable securement, use at least four cable ties to secure the cable to the rack at least 4 inches apart with the first one located within 6 inches of the terminal block.*

C6.0   ORDERING INFORMATION
To order the optional Dual-Source -48VDC power supply factory installed, order "Dual-Src48V" as a separate line item following the product model.
    Example: **Magnum 6KQR-48VDC**
        Dual-Src-48V   for the regular DS model

Similarly, order the "Dual –source 24VDC" or "Dual-source 125VDC" as a separate line item following the product model.
    Example: **Magnum 6KQ-24VDC or Magnum P6KQ-125VDC**
        Dual-Src24V for regular models
        Or **Dual-Src125V-Switch**

See the Configuration Guide on the GCI web site at
http://www.garrettcom.com/techsupport/insertion_guides/6kqcg.pdf
for additional information.

C7.0   OPERATION
 Operation of the Dual-Source Magnum 6Ks-48VDC, 24VDC and 125VDC Switch models are identical to that of the standard models.